EGA/VGA ULTRA

Advanced Graphics Board
OPERATION GUIDE

Important FCC Statement

The equipment described in this manual generates and uses radio frequency energy. If it isn't installed an used properly, that is, in strict accordance with the instruction manual, it may to radio and television reception. It has been type tested and found to comply with the limits for a Class-B computing device in accordance with the specifications in Sub-part J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

* Re-orient the receiving antenna.
* Relocate the device with respect to the receiver.
* Move the computer away from the receiver.
* Plug the computer into a different outlet so that the computer and receiver are on different branch circuits.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful: "How to Identify and Resolve Radio-TV Interference Problems." This booklet is available from the U.S. Government Printing Office, Washington, DC. 20402, Stock No. 004-000-00345-4.

NOTE: An un-shielded plug or cable may cause radiation interference. The peripheral device is designed for use with a properly shielded interface cable. The shield must be connected directly to the chassis of the peripheral device.

INTRODUCTION

Product Description:

The VGA-Ultra Graphics board is register-level compatible with software designed for the IBM Variable Graphics Array (VGA), Enhanced Graphics Adapter (EGA), Color Graphics Adapter (CGA), Monochrome Display Adapter (MDA), and the Hercules Graphics Card (HGC). This means that you can run all the off-the-shelf software written for IBM PS/2 system or The Enhanced Graphics Adapter on your VGA-Ultra Graphics board with absolutely no drivers or patches. The VGA-Ultra is a complete, easy replacement for the VGA and EGA . . . and much more.

The VGA-Ultra Graphics board can run virtually all programs designed for PS/2 system and all EGA software, and, every VGA-Ultra Graphics board comes with a full 512K bytes of memory (for level B only contain 256K bytes memory on board). Software written to take advantage of high resolution is being made available for VGA standards and is becoming more prolific for EGA.

Features:

The VGA-Ultra supports all the features of the IBM Variable Graphics Array (VGA) standard. This means that virtually all software made for IBM PS/2 system and the VGA standard will run using the VGA-Ultra Graphics board. Even more VGA-Ultra Graphics board supports EGA, CGA, MDA, Hercules, and extra advance extended graphics mode.

* Support for both analog and digital monitors including:
  * PS/2 analog monitor or compatible (IBM 8512, 8513, 8514, and 8503 analog monochrome monitor)
  * Variable Frequency Display (such as NEC MultiSync)
  * IBM Enhanced Color Display or compatible (IBM 5154)
  * IBM Color Display or compatible (IBM 5153)
  * IBM Monochrome Display or compatible (IBM 5151)
  * AT&T, Olivetti, Zenith (400 lines monitor)

* Support for digital and analog graphics modes including:
  * IBM VGA mode
    * 640x480, 16 colors/256K color palette
    * 320x200, 64 shades of gray
    * 320x200, 256 colors/256K color palette
  * IBM MCGA/VGA mode
    * 640x480, 2 colors/256K color palette
    * 320x200, 256 colors/256K color palette
  * IBM EGA mode
    * 640x350, 16 colors/64 color palette
    * 640x200, 16 colors/64 color palette
    * 320x200, 16 colors/64 color palette
  * IBM CGA mode
    * 640x200, 2 colors
    * 320x200, 4 colors
  * Hercules
    * 720x348, monochrome graphics

* Advanced Extended Graphics mode
  * 640x350, 256 colors/256K color palette
  * 640x480, 256 colors/256K color palette
  * 800x600, 16 colors/256K color palette
  * 800x600, 256 colors/256K color palette
  * 1024x768, 16 colors/256K color palette

* Advanced extended text modes including:
  * 50/60 lines of 80 column text
  * 25/28/44 lines of 132 column text
  * 40 lines of 100 column text
  * Supports Custom font loader and font editor let you instantly change the set of characters displayed on the screen and customs your own fonts

* Smooth, flicker-free horizontal and vertical scrolling and panning

* Hardware ZOOM, PAN, and WINDOW

* A powerful custom designed VLSI chip for increased speed, reliability, and compatibility

INSTALLATION

Overview:

This section presents information to help you properly install the VGA-Ultra graphics board in your personal computer. Installing the card in your computer system is quite straightforward. In general, you take the following action:

1. Ensure the computer you're using is compatible with the VGA-Ultra Graphics board. See "System Compatibility Issues" below.

2. Base on the type of monitor attached to your computer, set the monitor select jumper on the VGA-Ultra Graphics board. See "The Monitor Select Jumper Setting" & "Monitor Compatibility Issues" below.

3. Set a bank of switches on the VGA-Ultra Graphics board to control how it behaves each time the computer is powered on. See "Installation requirements & Configuration Switches" as below.

4. Install the VGA-Ultra Graphics board in the computer's expansion slot and reset your system configuration setting on your computer system. See "Installation Procedure" below.

System Compatibility Issues.

1. System Requirements

You can install the VGA-Ultra Graphic board in any open system expansion slot in either the IBM PC, PC/XT, PC/AT, PS/2 Model 30 or compatible computers. The only exception is slot #8 for the IBM PC and PC/

XT. If you have an IBM PC or IBM PC/XT please refer to your "IBM PC Guide to Operations" for specification of your slot #8. There are certain considerations to be aware of prior to installing the VGA-Ultra Graphics board. However you may need to make minor modifications to your system.

2. System Verification (ROM BIOS)

For early IBM PC, PC/XT ROM BIOS, PC and PC/XT manufactured prior to April 1983, must have a new ROM module installed on the system board before install the VGA-Ultra Graphics board. For you may not be able properly boot up and operate the VGA-Ultra so you need to update your system ROM or system BIOS ROM before you install the VGA-Ultra Graphics board.

If you are not certain which ROM module installed on your system board. VGA-Ultra Utilities Diskette provides a utility called ROMDATE.COM will output the date of ROM BIOS to the screen. If the date displayed is earlier than "10/27/82", a new ROM module is required. Contact your dealer for a ROM BIOS update if necessary prior to install your VGA-Ultra Graphics board.

Note: For all PC/ATs support the VGA-Ultra Graphics board. For older PC and PC/XT compatibles, check with the manufacturer or dealer if you can't determine ROM BIOS compatibility, to make sure your system can support the IBM Enhance Graphics Adapter.

The Monitor Select Jumper Setting:

A two position jumper, located near the top right corner of the VGA-Ultra Graphics board, must be set to the current position prior to installation. When VGA-Ultra configured for color display, it performs with an analog

or TTL display monitor, depending on the device attached and the jumper JP1 setting.

JP1 represents the operation mode selecting for the display attached to the VGA-Ultra Graphic board.

1&2 --- Color operation
2&3 --- TTL Monochrome operation

Monitor Compatibility Issue:

1. Monitor Compatibility Specifications Table

Display Type	Monochrome	Color	Enhanced Color
H-Scan Rate	18.432 KHz	15.750 KHz	21.850 KHz
V-Scan Rate	50 Hz	60 Hz	60 Hz
Band Width	16.257 MHz	14.318 MHz	16.257 MHz
Resolution	720x350	640x200	640x350

Display Type	Variable Frequency
H-Scan Rate	from 15 KHz to 36 KHz
V-Scan Rate	from 45 Hz to 90 Hz
Band Width	30 MHz or higher
Resolution	Maximum 800x600

2. The following chart shows the display monitor that may be attached to the VGA-Ultra graphics board and maximum display resolution capabilities.

Monitor Capability Table

DISPLAY MODEL	RESOLUTION	COLOR CAPABILITY
IBM 8514	1024x768	16 Colors Analog Color
IBM 8513	640x480	16 Colors Analog Color
IBM 8512	640x480	2 Colors Analog Color
IBM 8503	640x480	16 Shades Analog Monochrome
IBM 5154	640x350	16 Colors TTL Color
IBM 5153	640x200	16 Colors TTL Color
IBM 5151	720x348	Hercules mode TTL Monochrome
NEC MultiSync XL	1024x768	16 Colors Analog Color
Variable Frequency	800x600	256 Colors Analog Color/ 16 Colors TTL Color

3. Compatible Variable Frequency Monitors Listing

Mitsubish Diamond Scan AUM 1371A
NEC MultiSync (Plus/XL)
Sony Multiscan CPD 1302
Thompson Ultrascan 4375M
Puretek SuperScan PT-3000
Princeton UltraSync
Taxan Multivision 770 Plus
Magnavox MultiMode 8CM873
Logitech Autosync TE5155
Nanao Flexscan 8060S
Conrac Model 7250
Electrohome ECM 1310/1312/1910 and others . . .

CAUTION: Depending on the monitor connected, damage will result to it by setting the configuration switches incorrect. Be sure that TTL monitors are connected to the 9-pin connector and analog monitors are connected to the 15-pin interface connector. Before you select your displays, we suggest that you check the compatibility specifications listed above and check with your dealer to ensure the compatibility of any particular display.

Installation Requirements & Configuration Switches:

Before setting your switches configuration you need to set the switches to indicate:

1. The type of display monitor attached to your graphics board.

2. The mode of operation desired on system power-up.

3. Which display the computer should use, if more than one display, when the power is turned on.

The VGA-Ultra card has a set of switches which determine which one of its many operating modes it enters each time that the computer is powered up. For the vast majority of users, we recommends that the configuration switches be set in one of only a few ways, based on what type of monitor you intend to connect to the graphics board.

The IBM PC series computers and compatibles allow for a maximum of two display adapters to be installed in a given system, and only one of then can be a color graphics display adapter. The VGA-Ultra can coexist in a computer system with either a monochrome or color graphics adapter. If a monochrome adapter is installed in the

system, the VGA-Ultra must be configured as a color adapter whether or not a monitor is attached Conversely, if a CGA is in the system, the VGA-Ultra must be configured as a monochrome board whether or not a monitor is attached.

Under this arrangement, you could run certain software packages where it is helpful to have two monitor being used simultaneously. In general, if you plan to use only one display with your system, we recommended that you remove any display adapter cards prior to install the VGA-Ultra Graphics board.

NOTE: Although you may install a VGA-Ultra Graphics board in a system which already has a color graphics adapter or a monochrome graphics display adapter (such as the Hercules adapter), use of its display modes would be severely restricted, thereby diminishing its value.

The following tables will guide you in selecting the right VGA-Ultra switch settings for your system configuration.

Configuration Switches Tables

Switch Settings				Display Attached & Initial Mode Selection	
SW1	SW2	SW3	SW4	Primary Display Attached to VGA-Ultra	Secondary Display Attached to Mono. Card or none
on	off	off	off	Color 80x25 (IBM85xx) **Analog Mode**	Monochrome (IBM5151) or none
off	off	off	off	Color 80x25 Variable frequency **Analog Mode**	Monochrome (IBM5151) or none
on	off	off	on	Color 40x25 (IBM5153)	Monochrome (IBM5151) or none
off	off	off	on	Color 80x25 (IBM5153)	Monochrome (IBM5151) or none
on	on	on	off	Enhanced color (IBM5154 or compatible)	Monochrome (IBM5151) or none
off	on	on	off	Variable frequency or Enhanced color	Monochrome (IBM5151) or none

Configuration Switches Tables (Continue)

Switch Settings				Display Attached & Initial Mode Selection	
SW1	SW2	SW3	SW4	Primary Display Attached to VGA-Ultra	Secondary Display Attached to Color Graphics Card
on	off	on	off	Monochrome (IBM5151)	Color 40x25 (IBM5153) or none
off	off	on	off	Monochrome (IBM5151)	Color 80x25 (IBM5153) or none

SW1	SW2	SW3	SW4	Primary Display Attached to Monochrome Card	Secondary Display Attached to VGA-Ultra
on	on	on	on	Monochrome (IBM5151)	Color 40x25 (IBM5153) or none
off	on	on	on	Monochrome (IBM5151)	Color 80x25 (IBM5153) or none
on	off	on	on	Monochrome (IBM5151)	Enhanced color (IBM5154 compatible)

Configuration Switches Tables (Continue)

Switch Settings				Display Attached & Initial Mode Selection	
SW1	SW2	SW3	SW4	Primary Display Attached to Monochrome Card	Secondary Display Attached to VGA-Ultra
off	off	on	on	Monochrome (IBM5151)	Variable frequency or Enhanced color
on	on	off	off	Monochrome (IBM5151)	Color 80x25 (IBM85xx)
off	on	off	off	Monochrome (IBM5151)	Color 80x25 (Analog) Variable frequency
SW1	SW2	SW3	SW4	Primary Display Attached to Color Graphics Card	Secondary Display Attached to VGA-Ultra
on	on	off	on	Color 40x25 (IBM5153)	Monochrome (IBM5151) or none
off	on	off	on	Color 80x25 (IBM5153)	Monochrome (IBM5151) or none

Hints on Setting The VGA-Ultra Graphics Board:

1) How many VGA-Ultra Graphics board is allowed in a system?

Hint: No more than one VGA-Ultra Graphics board is allowed in a system.

2) Is VGA-Ultra Graphics board and an IBM EGA compatible board can be installed together?

Hint: No. The VGA-Ultra board is completely compatible with the IBM Enhanced Graphics Adapter. Because the boards appear identical to the computer system, the VGA-Ultra can not coexist with the IBM EGA, and vice-versa.

3) What type monitors I can use with VGA-Ultra Graphics board?

Hint: The VGA-Ultra board can actually drive several distinct types display monitors. The VGA-Ultra board can drive an analog variable frequency color display, and the IBM 8512, 8513, and 8514 analog color displays (132 column text mode not supported). It can also drive TTL (digital) monochrome and color displays. We recommend that you use a variable frequency color display with VGA-Ultra Graphic board. The variable frequency color displays take full advanced features, allowing a maximum resolution of 1024x768 with 16 colors available from a palette of 256K and supporting all text modes.

CAUTION: Before you attach your display to your Graphic board you must set the VGA-Ultra board's switches correctly for whatever display you have attached.

4) If I have more than one display adapter installed, how do I know which one text will come up on when I start my computer?

Hint: The system switch configuration tables shown on above page cover all valid combinations of the VGA-Ultra and other display adapters, and the switch settings required in each configuration. "Primary Display" refers to the display that is active when the computer is started up, while "Secondary Display" refers to a second display that is installed but isn't the primary display.

No display actually has to be attached to the secondary adapter; a display must always be attached to the primary display so you can read the screen when you start your computer. Therefore, you should set the VGA-Ultra switches so that the display you want to use will be primary when start the computer. Once the computer is started, you can use the DOS MODE utility to switch the display from one screen to the other.

5) What is the difference between TTL video output and Analog video output on VGA-Ultra?

Hint: The VGA-Ultra is intended for analog output for maximum performance. If the display monitor isn't capable of accepting analog input then it must be interfaced with the TTL 9-pin connector on the VGA-Ultra. TTL monitors are capable of delivering no more than 64 colors. The VGA-Ultra uses DB-15 cable available from monitor manufacturers to interface with the IBM PS/2 computers. The DB-9 connector on the VGA-Ultra is for interfacing TTL monitors only.

CAUTION: Do not interface monitors with the adapter as this may result in damage to the adapter and/or display. The NEC MultiSync monitor includes a DB-9 cable that will work with the VGA-Ultra, but with a maximum resolution of 800x600. Be sure the NEC MultiSync or other variable-frequency monitor is switched appropriately for analog or digital operation before connecting to your VGA-Ultra Graphics board.

About Setting the VGA-Ultra Graphics Board:

The VGA-Ultra graphics board can be used with either an analog display monitor via 15-pins connector or digital (TTL) monitor via 9-pins monitor depending on the device attached, the jumper settings and switch settings. The switch settings on the "Configuration Switches Tables" are provided for you to set your VGA-Ultra to the appropriate configuration for your equipment.

CAUTION: When your system is turned on, the VGA-Ultra checks its analog connector and hardware switch to set its mode. If VGA-Ultra is connected to an analog monitor through its 15-pins connector, it selects the VGA mode regardless of its hardware switch setting. Because over 90% of the time VGA-Ultra would be used in VGA mode so we program VGA-Ultra Video BIOS in this way for users convenience. If VGA-Ultra isn't connected to an analog monitor through its 15-pins connector, it then reads hardware switch setting and sets its mode accordingly.

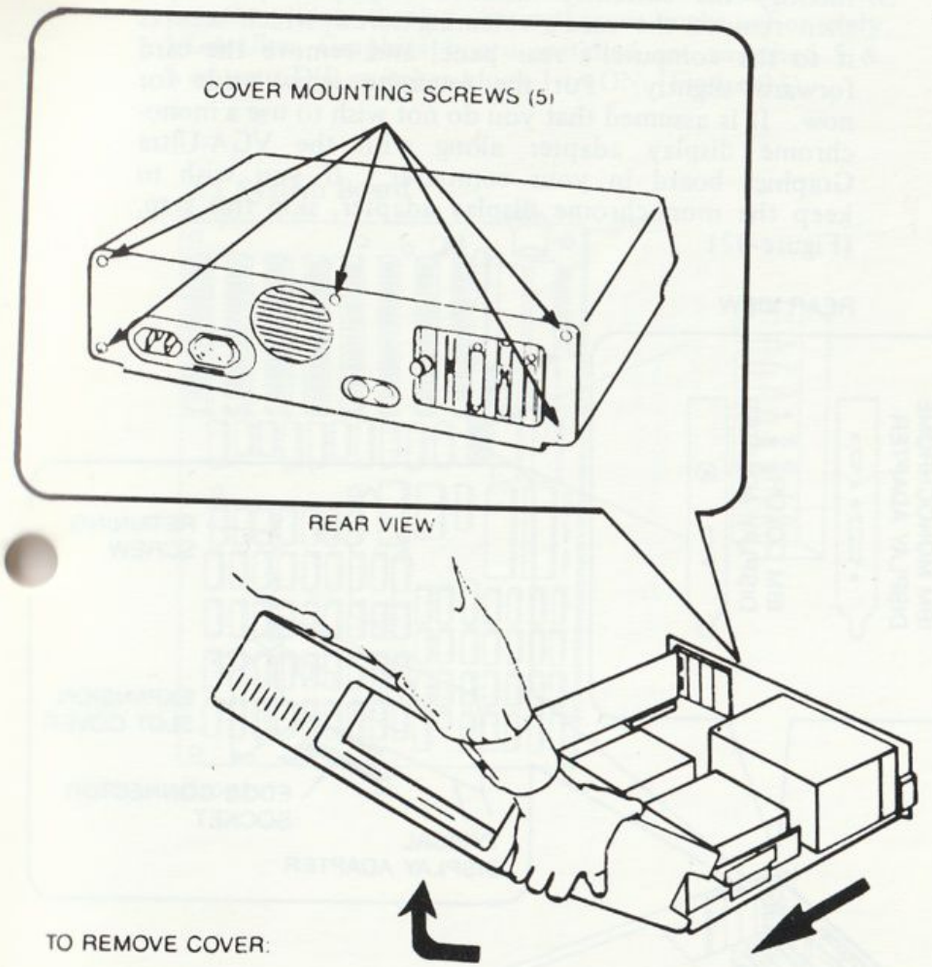
For BIOS compatibility problem we strongly suggest that you better use a multi-frequency

monitor within analog mode (SW1-SW4 all in off). Even for MDA, CGA, EGA and HERCULES compatibility, combines with VMODE utility you won't get more problems than only by hardware setting.

Installation Procedure:

To install the VGA-Ultra Graphic board, follow the steps below.

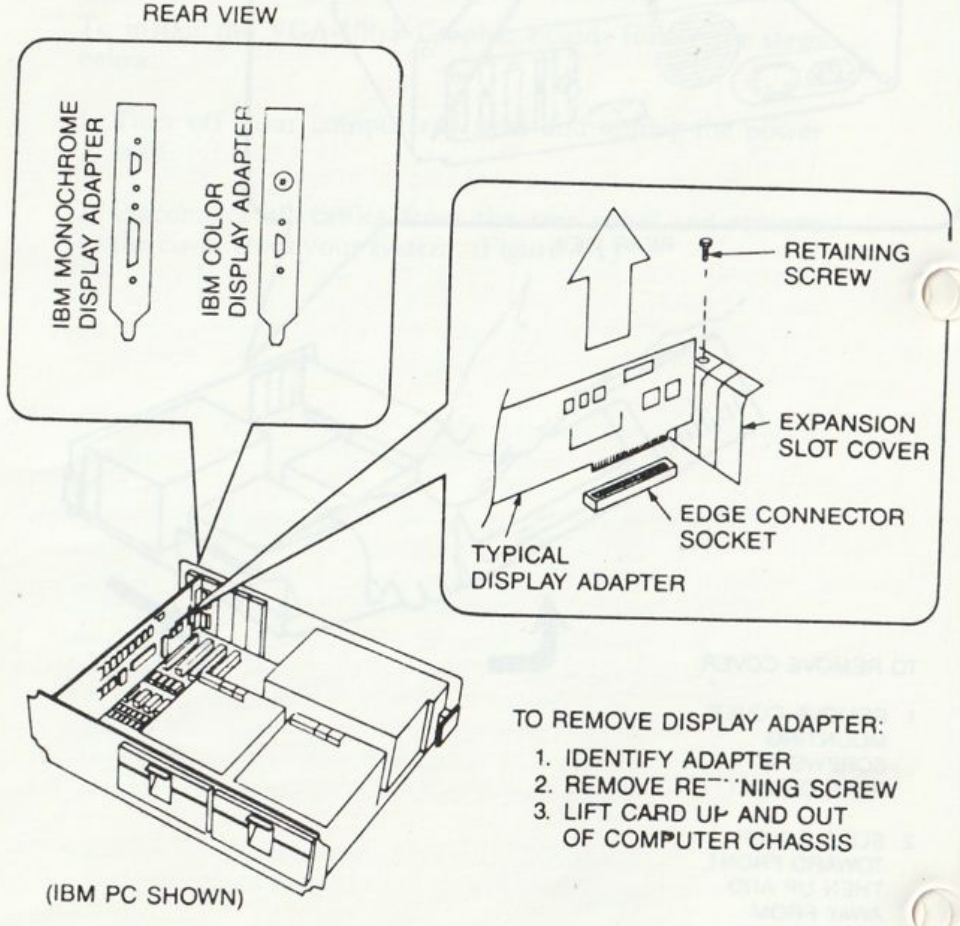
1. Turn off your computer system and unplug the power cord.
2. Disconnect all cables from the rear panel and remove the cover from your system. (Figure -01)



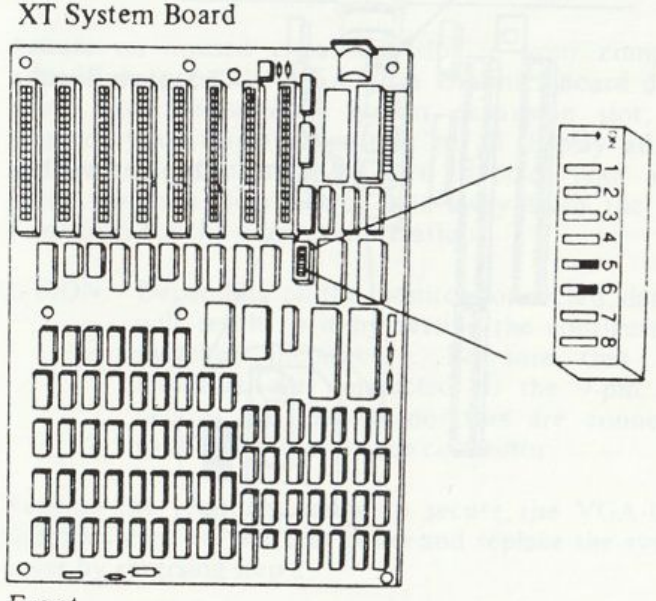
TO REMOVE COVER:

1. REMOVE COVER MOUNTING SCREWS AT REAR OF UNIT
2. SLIDE COVER TOWARD FRONT, THEN UP AND AWAY FROM CHASSIS

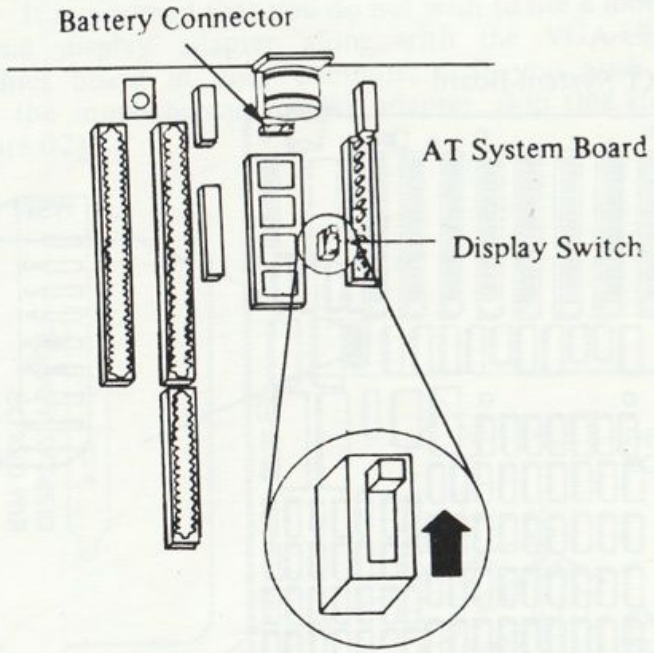
3. Identify the currently installed display adapter card, then remove the card's retaining screw which secures it to the computer's rear panel and remove the card forward slightly. Put the retaining screw aside for now. It is assumed that you do not wish to use a monochrome display adapter along with the VGA-Ultra Graphics board in your computer. If you wish to keep the monochrome display adapter, skip this step. (Figure-02)



4. For PC, PC/XT users, set the switch on the system for the video display option accordingly. For only VGA-Ultra Graphics board installed set switched 5 & 6 of your DIP switches block 1 to ON. (Figure-03)



For PC/AT, set the display switch as indicated below and run the SET UP Utility in your computer system after instali your system. (Figure-04)



5. Set Monitor Select Jumper and Configuration switches on VGA-Ultra Graphics board, as your desired.

   Refer to the above sections "Installation Requirements & Configuration Switches" and "Hints On Setting The VGA-Ultra Graphics Board", for more details.

6. Locate on unused expansion slot in your computer and firmly press the VGA-Ultra Graphics board downward into the selected system expansion slot, and connect your display monitors to all display adapter connectors. If possible be sure to place your VGA-Ultra Graphics board two slots away from the Disk Controller for the noise consideration.

CAUTION: Depending on the monitor connected, damage will result to it by setting the configuration switches incorrect. Be sure that TTL monitors are connected to the 9-pin connector and analog monitors are connected to the 15-pin interface connector.

7. Replace the retaining screw to secure the VGA-Ultra Graphics card to the rear panel and replace the system cover by reversing step 2.

8. Plug in computer's power cord now this completes the installation of your VGA-Ultra Graphics board.

NOTE: For IBM PC/ATs be sure to reconfigurate your system as now you are using.

Please refer to your system operation guide for more information.

OPERATION AND TROUBLE-SHOOTING

Trouble Shooting:

If you've carefully followed all the steps, your VGA-Ultra should be installed properly. However, listed below are common areas often missed when first installing a new board.

* Ensure that all cables are properly connected, and that all plugs are firmly seated in their sockets.

* Ensure that the display monitor is properly connected and that its power is turned on.

Power OFF the computer system and all other connected devices before checking the following:

* Ensure that the switches on the VGA-Ultra Graphics board are set properly and that the board is seated in the expansion slot.

* Ensure that the system motherboard switches/jumper(s) are set properly for use with VGA-Ultra.

* Ensure that no other switch settings on the motherboard have been accidentally changed. Refer to the User guide provided with your computer to determine the correct switch settings.

* Ensure that only ONE color adapter is installed on your computer system.

If checking these items does not locate the problem, there may be a malfunction of the computer system, display monitor or the VGA-Ultra Graphics board. Consult your computer dealer for assistance in locating the problem.

Diagnostic Software:

1) Whenever you turn on the power, your VGA-Ultra Graphic board performs a series of self-tests automatically. If an error occurs during the self-test, the VGA-Ultra Graphic board will attempt to display error message on your screen. If you receive a self-test error message, refer to section "Trouble Shooting" for additional instructions.

2) On the VGA-Ultra Utility Diskette, it supports a test program which can help you further verify that your VGA-Ultra Graphics board and attached display monitor are working properly.

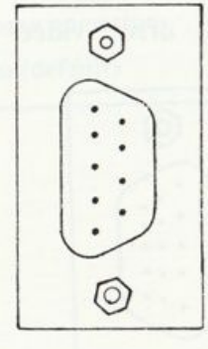
   * Be sure that the VDIAG.EXE utility is present on the diskette you are using.

   * At the DOS prompt, type VDIAG then press ENTER.

   * The test will start and prompt you with further instruction.

Connector Information:

1. J1 (DB-9) Direct drive video display connector. (Figure-05)



Signals for color display interface

Pin-out	Signal	Pin-out	Signal
1	Ground	6	Intensity
2	Ground	7	Reserved
3	Red	8	Horizontal Sync.
4	Green	9	Vertical Sync.
5	Blue		

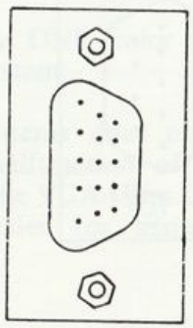
Signals for monochrome display interface

Pin-out	Signal	Pin-out	Signal
1	Ground	6	Intensity
2	Ground	7	Video
3	Reserved	8	Horizontal Sync.
4	Reserved	9	Vertical Sync.
5	Reserved		

Signals for enhanced color display interface

Pin-out	Signal	Pin-out	Signal
1	Ground	6	Secondary Green/Intensity
2	Secondary Red	7	Secondary Blue/Mono Video
3	Primary Red	8	Horizontal Sync.
4	Primary Green	9	Vertical Sync.
5	Primary Blue		

2. J2 (DB-15) Direct drive video display connector. (Figure-06)



Pin-out	Signal	Pin-out	Signal
1	Red	9	Not Used
2	Green	10	Ground
3	Blue	11	Monitor ID bit 0
4	Monitor ID bit 2	12	Monitor ID bit 1
5	Not used	13	Horizontal Sync
6	Ground	14	Vortical Sync
7	Ground	15	Not used
8	Ground		

JUMPER SETTINGS

Position	JP1	JP2
	Display attached to VGA/1024	IRQ2 Line Status
1&2	TTL Monochrome operation	IRQ2 Disabled (default)
2&3	Color operation (default)	IRQ2 Enabled

SOFTWARE UTILITIES

Software On Your VGA-Ultra Utility Diskette:

A program diskette comes with your VGA-Ultra board. It is referred to as the "VGA-Ultra Utility Diskette", and it includes several routines similar to some utilities found on your DOS diskette. Following are descriptions of these VGA-Ultra utilities and other files.

DMODE. EXE – Used to switch the VGA-Ultra board display mode.

VDIAG. COM – is a diagnostic file that tests all applications of the VGA-Ultra and details the configuration of the system.

VMODE. COM – used to switch the VGA-Ultra display modes. The VGA-Ultra mode displayed depends on the parameter used. For more details, please key in the command "VMODE?" at DOS prompt.

VANSI. SYS – replaces the ANSI.SYS device driver supplies on your DOS system disk. VANSI.SYS is compatible with the standard ANSI.SYS and additionally supports the extended screen modes provided by VGA-Ultra.

FONT. DOC – contains the latest information on the Font Editor and Font Loader, describing new fonts and features. Print this file and read it before he font software.

FEDIT. COM – the font editor, used to create new fonts and/or modify existing fonts. Users .FNT font files also included on your VGA-Ultra diskette.

FLOAD. COM – the font loader, used to load a selected font into video memory from disk.

README. BAT – contains additional information. It may contain instructions for using new VGA-Ultra utilities or other information which was not available at the time this manual was printed.

HOTKEY. COM
HOTZOOM. COM – a RAM resident zoom utility. Detail informations are on following pages.

ROMDATE. COM – checks your system BIOS ROM's date for your system verification.

SOFTWARE MODE SWITCHING

VGA-Ultra is designed to provide compatibility with following modes: IBM's VGA, EGA, CGA, MDA and Hercules mode.

DMODE.EXE is the utility program which is used to switch display modes after the PC is turned-on. Because VGA-Ultra supports various types of monitors, various display standards (VGA, EGA, CGA, MDA, Hercules) and various display formats (132-column text, high resolution graphics, etc.), the user has to properly set the VGA-Ultra into the specific mode desired via DMODE.EXE otherwise one may experience incompatibility difficulties with software being used.

DMODE is an easy-to-use, menu-driven program. By executing DMODE.EXE at DOS prompt, the following screen will appear.

ADVANCED DISPLAY MODE SETUP (DMODE)

MONITOR	ADAPTER MODE	FORMAT (TEXT)
1. MDA 2. CGA 3. EGA 4. VGA 5. Digital Multisync 6. Analog Multisync 7. Adjust Screen	1. MDA 2. CGA 3. EGA 4. VGA 5. Grayscale ON/OFF 6. VGA-Sync ON/OFF 7. (Reserved)	1. 40 x 25 2. 80 x 25 3. 80 x 60 4. 132 x 25 5. 132 x 28 6. 132 x 44 7. Extended Format
ACTION: Please move cursor to select functions. MESSAGE: (Press X to return to DOS) Active monitor or modes are in Golden color.		

User simply move cursor to select the monitor being used, the desire display mode, text format and press RETURN key.

An easy to understand on-screen operation instruction is included and will guide you through all steps.

The ADJUST SCREEN function (item No. 7 on DMODE menu) allows user to adjust the active display location on the screen. Many monitors have different display characteristics resulting in the display area on the monitor being too left, right, low or high under various modes. The ADJUST SCREEN allows user to customize the VGA-Ultra card to fit the monitor.

The ADJUST SCREEN remains active in the computer until the computer is re-booted. User may save or load the adjusted specifications.

Important

a. The DMODE will not allow you to switch to a mode which is not supported by the monitor specified.
b. "Soft-boot" your PC (by pressing Ctrl, Alt, Del keys) does not change the mode of VGA-ULTRA; this is also a concious decision for operational convenience. In most case when the PC is "soft-booted", the user wish to operate in the previous video mode.

DMODE.EXE for Selecting Text Display Format

In addition to the standard 80-column x 25-line text display format, the VGA-Ultra provides you with the capability to utilize extended column modes with text applications. This means that your VGA-Ultra when interfaced with appropriate color displays, can produce 132x44, 132x28, 132x25, and 80x60 modes in addition to the standard 80x25 and 40x25 modes. To use one of these formats simply enter DMODE select text display format desire for the menu.

Please note that the VGA-Ultra requires a variable frequency monitor to utilize the 132-column and 80x60 text display formats. 132-column and 80x60 text display are not supported on the IBM 8512, 8513 and 8514 analog monitors.

With the appropriate software, the 132-column display capability allows emulation of terminals that require 132 columns of text. Following is the list of terminal emulation packages that supports 132-column text.

Terminal Emulation Software for DEC

– General Micro	PC102, PC202
– FTG Data Systems	EMU.TEK
– Diversified Computer	EM220
– Persoft	SMARTTERM 125, 200, 240
– KEA Systems Ltd.	ZSTEMpc-VT220
– Microplot	PC Plot III
– Walker, Richer & Quinn	Reflection 1 & 2
– Coefficient Systems	Crosstalk 4.0

Terminal Emulation Software for IBM 3270

– Attachmate	Attachmate
– CXI	PCOX/ONE Rel 2.1
– IDEAssociates	Ideacom 3 in 1
– DCA	IRMA w/E78, IRMA 2

FONT. DOC – the latest information about the font software, describing new fonts and features. Print this file and read it before using the software.

FEDIT. COM – the font editor, used to create new fonts and/or modify existing fonts. Start the Font Editor by typing the command "FEDIT" at the DOS prompt. Select the Help option in FEDIT's main menu for more information.

FLOAD. COM – the font loader, used to load a selected font into video memory from disk. Up to four fonts may be stored in video memory at once, with any one of the fonts selected for display: Type the command FLOAD, with no parameters, for more information on the use of this program.

"?????? .FNT – (Assorted fonts) fonts packaged on your VGA-Ultra diskette include the two standard VGA-Ultra fonts, a font designed for the APL language, and a thin, single-dot font. You may modify any of these fonts as you wish with the font editor. Other fonts will be added in the future: check the README.DOC file on your diskette for the latest information. Any file on the Utility diskette with the extension .FNT contains a font.

NOTE: 1) See the FONT.DOC file on the VGA-Ultra Utility diskette for information on using the Font Editor.

2) Fonts may be loaded in text mode only. When a font is selected to be displayed, every character on the screen is immediately displayed in that new font.

3) Using the replacement ANSI standard console driver

FORMAT: DEVICE = VANSI.SYS

This command must appear in the configuration file (CONFIG.SYS) to install VANSI.SYS, just as the command to install the ANSI.SYS device driver that comes on the DOS diskette would appear. VANSI.SYS is compatible with the standard ANSI.SYS, and additionally supports the extended screen modes provided by VGA-Ultra. Once installed with the above command, VANSI.SYS provides all the screen control and keyboard remapping features of ANSI.SYS (see your DOS Technical reference manual). **VANSI.SYS is a replacement for ANSI.SYS, and the two should not be in use at the same time.**

VANSI.SYS may be used to select the extended VGA-Ultra screen modes. This is accomplished by issuing an escape sequence with the "set mode" command, just as any standard mode would be selected with the normal ANSI.SYS. For example, screen mode 22 hex would be selected by sending the escape sequence:

"(Esc) [=34h"

To the screen. (Note that 34 is the decimal equivalent

of 22 hex-decimal). To select other modes, simply replace 34 with the number of the mode you wish to select.

The available extended screen modes using variable frequency display are as follows. And for detail information please refer to the chapter "VGA-Ultra PROGRAMMER'S GUIDE".

MODE	COLUMNS	ROWS
34 dec (22 hex)	132	44
35 dec (23 hex)	132	25
36 dec (24 hex)	132	28
42 dec (2A hex)	100	40
38 dec (26 hex)	80	60
2 dec (02 hex)	80	25

For example, to place the screen in 132-column by 44-row mode, do the following. Place the DEVICE command:

```
DEVICE = VANSI.SYS
```

In the CONFIG.SYS file on a bootable disk, and place VANSI.SYS and BASICA.COM/GWBASIC.EXE on that disk. Boot the system, and in response to the DOS prompt, type BASICA/GWBASIC, them press ENTER and type the following BASIC commands:

```
OPEN "0",1, "TEMP.DAT"
PRINT #1, CHR$(27);"[=34h"?
CLOSE
SYSTEM
```

This creates the file TEMP.DAT, containing the escape sequence to select mode 22 hex, 132-column mode. In response to the DOS prompt, type

```
TYPE TEMP.DAT then press ENTER
```


Which sends the escape sequence to the screen. The screen is immediately set to 132-column mode. Note that the escape sequence in not displayed; it is interpreted as a command rather than displayable text.

4) Using VGA-Ultra ZOOM utility

The ZOOM utility consists of two RAM resident programs that allow graphics program running on the VGA-Ultra board to perform hardware zooming, panning and scrolling at the touch of a key. The programs HOTKEY and HOTZOOM are included on your Utility Diskette.

The ZOOM utility works by using the BIOS keyboard interrupt to check for the ZOOM utility programs. Programs such as AUTOCAD permit the use of this keyboard interrupt. Some graphics programs bypass the keyboard interrupt and may not allow ZOOM to function.

ZOOM is useful when working with interactive programs which allow editing of the graphics display screen. Once the programs are installed, you may bring up the ZOOM at any time within a graphics application by pressing the pre-defined hotkey. You may specify any key on the keyboard as the hot key.

QUICK INSTALLATION

Before you enter your graphics application, you must load the ZOOM utility programs into memory. Note that you should only do this once after booting your PC.

1. Insert the VGA-Ultra Utility Diskette into drive A.

2. Type:

HOTKEY
HOTZOOM

3. Once you have entered a graphic application you may press the F10 (function) key to invoke the ZOOM program.

Note: ZOOM uses the F10 key as the default hotkey to invoke the program. Some software applications may already use this key for other purposes. Configure your ZOOM hot key for another key if F10 conflicts with your software.

Zooming the Display

Once you have pressed the hotkey and entered the ZOOM program, you will see a 3x3 character box in the upper left hand corner of the display. This box is a reminder that you are now in the zoom program and can use some of the keypad keys to perform various functions. We call this specify mode since the user is able to specify the zoom factor and the area of the display currently being viewed. You can return to your application program by re-hitting the hot key.

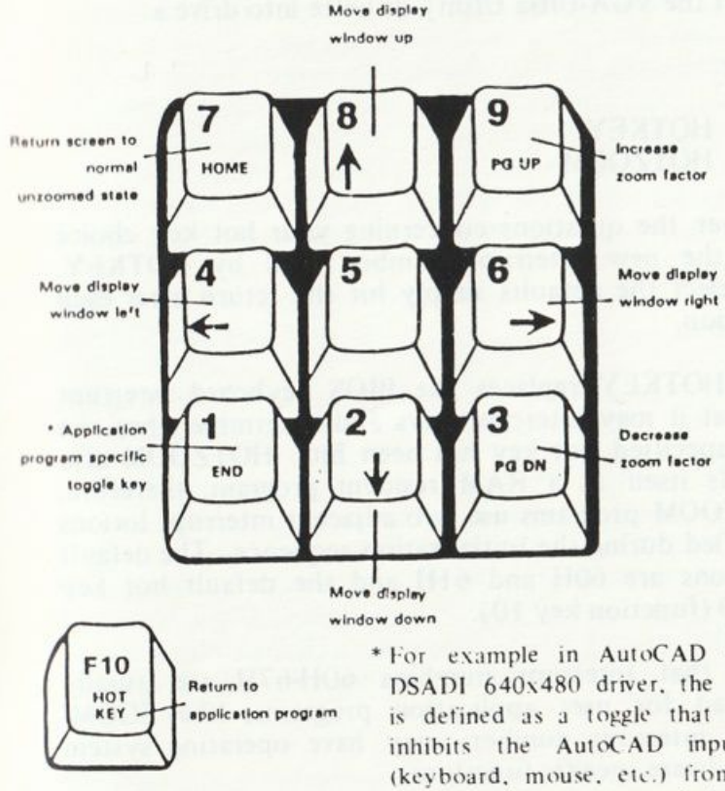
In specify mode the user can use these keys to perform the following functions:

KEY	DEFINITION
Home	Return screen to normal unzoomed state
Up Arrow	Move Display window up
Pg Up	Increase zoom factor
Left Arrow	Move display window left
Right Arrow	Move display window right
End	Application program specific toggle key

KEY	DEFINITION
Down Arrow	Move display window down
Pg Dn	Decrease zoom factor
Hot Key	Return to application program

For example in AUTOCAD using the DSVGA 640x480 driver, the END key in defined as a toggle that allows or inhibits the AUTOCAD input device (keyboard, mouse, etc.) from panning the display window during cursor movement.

CAUTION: HOTKEY, HOTZOOM utilities will not work properly under inter-lace mode.



* For example in AutoCAD using the DSADI 640x480 driver, the END key is defined as a toggle that allows or inhibits the AutoCAD input device (keyboard, mouse, etc.) from panning the display window during cursor movement.

Conflicts with other RAM resident programs and Changing the Hot key

Since the ZOOM programs are RAM resident utilities, and many users now load other RAM resident routines in their system, conflicts may result when one program uses the same interrupt number as another RAM resident program. If you suspect there exists a conflict in your system you may wish to load the HOTKEY program at a different interrupt location or perhaps the hot key that wakes HOTZOOM up. If you have previously loaded the ZOOM program, re-boot your computer and perform the following steps:

1. Insert the VGA-Ultra Utility diskette into drive a

2. Type:

   HOTKEY 1
   HOTZOOM

3. Answer the questions concerning your hot key choice and the new interrupt number used by HOTKEY. To select the defaults simply hit the return after each question.

   The HOTKEY replaces the BIOS keyboard interrupt so that it may intercept keys and determine when the user specified hot key has been hit. HOTZOOM also installs itself as a RAM resident program, therefore, the ZOOM programs use two adjacent interrupt lotions specified during the initialization sequence. The default locations are 60H and 61H and the default hot key is F10 (function key 10).

   Note that interrupt numbers 60H-67H are usually reserved for user application programs, like ZOOM. Other interrupt numbers may have operating system or hardware specific functions.

4. Make sure you load the HOTKEY and HOTZOOM programs before you run an application program.

SOFTWARE DRIVERS

Text Driver Installation for Lotus 1-2-3 and Symphony

CAUTION: Please note that 132-column and 80x60 text modes require variable frequency (TTL or analog). These text modes are not supported on IBM PS/2 85xx analog monitors.

Introduction

Six drivers for Lotus 1-2-3 Release 2 or later and Symphony Release 1.1 or later are provided on your VGA-Ultra Utility Diskette under sub-directory name LOTUS. The files are SIBMØ8Ø.DRV, SIBMØ25.DRV, SIBMØ28.DRV, SIBMØ44.DRV, SIBMØ60.DRV, SIBMØFLY.DRV. These drivers support all the text modes of the VGA-Ultra board: 80x25, 132x25, 132x28, 132x44 and 80x60. There is one driver dedicated to each of these five modes; each of these drivers, when selected as the active text display for a Lotus products, will automatically cause individual Lotus PrintGraph, etc.) to display in the selected format. For example, if the 132x28 driver has been selected in the installation procedure, as described below, then when 1-2-3 is run, the spread-sheet will display 132 columns by 28 rows of text.

There is also the 'All modes' driver which supports all five text display modes of the VGA-Ultra board. When this driver is selected, each time you enter an individual Lotus program or utility, you are offered the choice of any of the five display modes. This allows you to switch between 80-column and 132-column displays without exiting to DOS.

We have provided six drivers to give you complete

flexibility in configuring Lotus products to meet you needs. If you always want a 132x28 display, install the 132x28 driver and you will automatically get that display every time you start a program from the Lotus or Access menu. If you want the 80x25 display most of the time for speed and reading ease, but want to be able to switch to the 132x44 display quickly to get an overall view of your spread-sheets, install the 'All Modes' driver and select the desired display each time you start 1-2-3 or Symphony. We've left you the freedom to pick the drivers that are right for you.

NOTE: When you are using the 'All Modes' driver, whenever you enter the Translate utility from the Lotus or Access menu, you should have 80x25 mode selected. The Translate utility operates differently from the other programs and utilities, and often does not show 132-column displays properly from the 'All Modes' driver. Also, the install utility always comes up in 80-column mode, no matter what driver is used.

Installation Instructions

Before installing the text drivers, be sure that you have read GETTING STARTED in the Lotus 1-2-3 or the Lotus Symphony documentation. This documentation assumes that you are familiar with the install program and procedures outlined in the Lotus documentation. The Lotus Install program permits new drivers to be added to the driver library via the Add New drivers to Library option of the advanced Options Menu. Once the text drivers are added to the library you may select them via the Modify Current Driver Set option of the Advanced Options Menu.

Please note that the following instruction assumes that you have a Hard disk system.

1. Insert the VGA-Ultra Utility diskette into drive A. Text drivers are in the VGA-Ultra Utility Diskette under LOTUS sub-directory.

2. Copy all text drivers from VGA-Ultra Utility diskette into the hard disk that has Lotus program files. Please type:

   COPY A:\LOTUS*.DRV

3. Perform the First-time Installation of your Lotus. Refer to the Lotus GETTING START documentation for instructions on running the Install program. Select the First-Time Installation option from the main menu. The Installation program will guide you through the procedure of selecting the drivers you want. Remember that VGA-Ultra supports the IBM Enhanced Graphics format, so you should select the EGA card for the initial text and graphics screen display device.

4. When you have completed the driver selection, press F10 function key to display the current driver selections. Please note that the Text Display and Graph display selections must match the samples below in order to use the text drivers. You may want to create several driver sets, and experiment to see which suits you need.

   a) At Lotus 1-2-3 it should like:
   Text Display IBM Enhanced Graphics
   Graph Display IBM Enhanced Graphics

   b) At Lotus symphony it should like:
   Text Display University Text Display – Separate
   Graph Display IBM Enhanced Graphics – Separate

   When you have completed your selections, the Install program saves the drivers you select in a file, or driver set, called 123.SET for Lotus 1-2-3 or LOTUS.SET

for Lotus Symphony. When prompted, respond that you do not want to leave the Install program at this time. Continue with step 5; you are now ready to install the text drivers.

5. You should be in the Main Menu of the Install program at this point. Select Advanced Options form the Install Main Menu and press RETURN.

6. The Advanced Options Menu will appear on your screen. Select Add New Drivers to Library and press RETURN. Note that this step only needs to be performed once.

7. The Install program will ask you to press RETURN. This step creates a file named SINGLE.LBR which contains the drivers we are adding. (Step 3 above copied the drivers from the Utility Diskette to your hard disk, so you are all set to go.)

8. The Advanced Options Menu will appear on your screen. Select Modify current driver set and press RETURN.

9. The current drivers selected will appear on your screen. Select Text Display and press RETURN.

10. The text display drivers will appear on you screen. Select the VGA-Ultra Utility driver you want to use and press RETURN. As discussed earlier, the available drivers are:

    VGA-Ultra Card (All Modes)
    VGA-Ultra Card (80x25)
    VGA-Ultra Card (132x25)
    VGA-Ultra Card (132x28)
    VGA-Ultra Card (132x44)
    VGA-Ultra Card (80x60)

11. The currently selected drivers will appear on your screen. Verify that the driver you selected appears in the Text Display field. Select Return to menu and press RETURN.

12. The Advanced Options Menu will appear on your screen. Select Save Changes and press RETURN.

13. At this time the Install program prompts you for the name of your driver set. Lotus 1-2-3 and Lotus symphony permit selection of the driver set to use when you start the program. If you want to name the driver set, type the name and then press RETURN. For example, if you selected the VGA-Ultra Utility Display (132x28) driver you many wish to name it VGA28. To save the current driver set using the default name of 123 for Lotus 1-2-3 or LOTUS for Lotus Symphony simply press RETURN. These default driver sets will be used automatically if you don't explicitly select another driver set when you run Lotus or Access.

14. The Install program will inform you that the driver set has been saved. Press RETURN. The Exit Menu will appear on your screen. You can create additional driver sets at any time by selecting the Advanced Options Menu, Modify Current Driver Set, and Save Changes procedures of the Install program (set 8 through 13 above). If you want to create additional driver sets now, press RETURN to go to the Main Menu. Don't forget to use a different name for each driver you save. When you are finished select Yes and press RETURN to exit the Install program.

15. Refer to the "Lotus Getting start documentation" to learn how to start Lotus 1-2-3 or Lotus symphony. Below are some examples of how to select a different driver set when starting the program.

If you are starting Lotus 1-2-3:

* Type LOTUS and press RETURN to use the default driver set

* Type LOTUS VGA28 and press RETURN, where VGA28 is the name of the driver set you created used for 132x28 text mode display on your VGA-Ultra board.

* Type LOTUS VGA44 and press RETURN, where VGA44 is the name of the driver set you created used for 132x44 text mode display on your VGA-Ultra board.

If you are starting Lotus Symphony:

* Type ACCESS and press RETURN to use the default driver set named LOTUS.

* Type ACCESS VGA28 and press RETURN, where VGA28 is the name of the driver set you created used for 132x28 text mode display on your VGA-Ultra board.

* Type ACCESS VGA44 and press RETURN, where VGA44 is the name of the driver set you created used for 132x44 text mode display on your VGA-Ultra board.

etc.

Using 'All Modes' text display for Lotus 1-2-3 & Symphony

If you select 'All Modes' text driver, after entering 1-2-3, a pop-up menu is activated by issuing Ctrl-A key input sequence, at which time the VGA-Ultra text display mode selection menu appears. After selecting the desired mode,

the RETURN/ENTER key is depressed causing a beep to emit from the system. This indicates that the desired mode has been set. You must then EXIT to the Lotus Access menu if the program was entered through the LOTUS command, or back to DOS if the program was entered with the 1-2-3 command in order to invoke the desired mode selection.

AUTOCAD 2.5

The instructions which follow are applicable to users of Autodesk's Inc. AutoCAD version 2.5 and VGA-Ultra Graphics Board. Note that, to use 800x600 and 1024x768 mode of the VGA-Ultra, a variable scan ANALOG color display or functional equivalent display monitor is required.

The VGA-Ultra Utility Diskette contains the AutoCAD ADI driver program named DSADI.EXE which makes full use of the high resolution graphics capabilities of the VGA-Ultra Graphics board.

CAUTION: VGA-Ultra level B do not support 1024x768 operation. If you select the 1024x768 mode it will hang up your system.

Instructions:

1) Copy the DSADI. EXE utility contained on the VGA-Ultra Utility Diskette to the AutoCAD directory.

2) The VGA-Ultra utility DSADI.EXE needs to be loaded before you can use the 1024x768, 800x600 and 640x480 modes with AutoCAD. Once loaded, the driver remains memory resident until you power off or restart your system. To load the driver program via one line of entry type "DSADI –r(12345) –v(nn)–z(yn)".

a) where –r selects the desired resolution listed below.

1 = 640x480 (8x8 Font, 16 color)
2 = 1024x768 (8x16 Font, 16 color)
3 = 640x480 (8x16 Font, 2 color)
4 = 800x600 (8x16 Font, 16 color)
5 = 640x480 (8x16 Font, 16 color)

b) where –v selects the interrupt vector for drive use (7AH is the default interrupt used by both AutoCAD and this driver).

c) where –z selects whether the menu should be zoomed or not, enter Y for yes or N for no.

EXAMPLE: DSADI –r2–v7D–zY will selects 1024x768 resolution, using interrupt 7D, and utilizing the zoom feature.

NOTE: 1) DSADI, and attached parameters may be invoked via a batch file. It may also be invoked using the following method, however the menu zoom option is not presented if invoked in this manner, type "DSADI". Then the utility will display the following:

––– AutoCAD ADI Driver V2.25 –––
Puretek VGA-Ultra Board AutoCAD Driver
(C) Copyright 1987, Tseng Labs, Inc.
If you are changing resolutions please respond with original INT number

Enter ADI INT number in HEX (Default = 7A) ==>

Please Enter Resolution

1 = 640x480 (8x8 Font, 16 color)
2 = 1024x768 (8x16 Font, 16 color)
3 = 640x480 (8x16 Font, 2 color)
4 = 800x600 (8x16 Font, 16 color)
5 = 640x480 (8x16 Font, 16 color)

Choice ==>

Be sure your monitor is capable of displaying the resolutions are included below.

2) The driver is now all set to be used at the resolution you selected. If later you wish to change the driver resolution just type DSADI again.

3) Using the AutoCAD documentation configure AutoCAD, simplified instructions are included below.

* Type "ACAD" and select Main Menu item 5 (configure AutoCAD).

* Select Configuration Menu item 3 (configure video display).

* Select ADI display.

* Select the hex-decimal interrupt, this must match your –v parameter selection when loading DSADI.

* Continue through the configuration menu. After you complete the configuration you can begin using AutoCAD.

AutoCAD Release 9

The instructions which follow are applicable to users of Autodesk's Inc. AutoCAD Release 9, and VGA-Ultra Graphics Board. Note that, to use 800x600 and 1024x768 mode of the VGA-Ultra, a variable scan ANALOG color display or functional equivalent display monitor is required.

The VGA-Ultra Utility Diskette contains the AutoCAD ADI driver program called TPACK.COM, which in turn is configured by a file called TINST.COM. The TPACK.COM program makes full use of the 640x480, 800x600 and 1024x768 graphics mode of the VGA-Ultra Graphics board.

To configure TPACK.COM you must first run the TINST.COM program. In running this, you must answer several questions dealing with Resolution, Configuration and Screen Colors by entering a new value or pressing RETURN to accept the default value displayed by each question. After all questions are answered in TINST.COM the program will display a message declaring the AutoCAD ADI driver successfully modified.

Note that there is an extensive list for determining the colors of the various entities comprising the graphic screen. The setting of these colors requires entering a color code number. The following is a listing of color code numbers.

0 Background	4 Cyan
1 Red	5 Blue
2 Yellow	6 Magenta
3 Green	7 White

8-15 intensified versions of codes 0-7

After setting colors for all of the screen elements, your ADI driver configuration is complete.

At this time, you should run TPACK.COM to load the configured driver, before loading AutoCAD. If you wish to change any of the screen element attributes, simply run TINST.COM again to make changes and run TPACK.COM again before loading AutoCAD. TPACK.COM should always be run before loading AutoCAD in order to display in the resolution, and with the screen attributes of your choice. After the ADI driver has been configured to your requirements and TPACK.COM has been run, then AutoCAD can be loaded.

CAUTION: VGA-Ultra level B do not support 1024x768 operation. If you select the 1024x768 mode it will hang up your system.

Using the AutoCAD documentation configure AutoCAD, Simplified instruction are included below.

* Type "ACAD" and select Main Menu item 5 (configure AutoCAD).
* Select Configuration Menu item 3 (configure video display).
* Select ADI display.
* Select the hex-decimal interrupt, this must match your interrupt I/O port when install TINST & TPACK.
* Continue through the configuration menu. After you complete the configuration you can begin using AutoCAD.

Windows version 2.xx

The instructions which follow are applicable to users of Microsoft Windows version 2.xx and VGA-Ultra Graphics board. Please note that, to use the 1024x768 mode, an

IBM 8514 or functional equivalent color monitor is required.

The VGA-Ultra Utility Diskette contains new driver files VGAU800.DRV, VGAU800.GRB, VGAU800.LGO, VGAU1024.DRV, VGAU1024.GRB and VGAU1024.LGO under WINDOWS2 sub-directory. These drivers will replace the driver files contained on the Windows Screen Driver Diskette.

NOTE: VGA-Ultra level B these files are VGAU601.DRV, VGAU601.GRB and VGAU601.LGO.

Instructions:

1) Run the Windows SETUP program as usual, when the choose the display adapter menu is displayed, select "Other Display Driver Supplied by Manufacturer" options.

2) When prompted by Windows, insert the VGA-Ultra Utility Diskette into driver "A:" and type A:\WINDOWS2 and press RETURN.

3) Windows will locate the supplied drivers and display:
   VGA-Ultra 800x600 16 colors
   VGA-Ultra 1024x768 16 colors

NOTE: For VGA-Ultra level B only support 800x600 resolution only.

4) Select the option you wish to use.

5) When prompted by Windows, select "VGA Fonts".

6) Continue with the rest of the Windows setup process. After you complete the above steps you can begin using Windows.

Windows version 1.xx

NOTE: VGA-Ultra level B do not support driver for this version.

The instructions which follow are applicable to users of Microsoft Windows version 1.xx and VGA-Ultra Graphics board. Please note that, to use the 1024x768 mode, an IBM 8514 or functional equivalent color monitor is required.

The VGA-Ultra Utility Diskette contains new driver files VGAU1024.DRV which replace the EGAHIRES.DRV file contained on the Windows Setup Diskette. The driver supplied makes full use of the 1024x768 graphic mode.

Instructions:

1) Using DISKCOPY.COM make a copy of the windows setup Diskette.

2) Copy VGAU1024.DRV to the copy of windows setup diskette using the destination named EGAHIRES.DRV.

EXAMPLE: COPY A:VGAU1024.DRV
B:EGAHIRES.DRV

3) Using the copy of the windows Setup Diskette which now contains the new driver, install Windows following the instructions supplied by Microsoft. Make sure you select the EGA option hi-resolution in the Windows Setup. (EGA more then 64K and with enhanced display).

4) Continue with the rest of the Windows setup process. After you complete the above steps you can begin using Windows.

VGA 1024x768 and 800x600 DRIVER INSTALLATION FOR MICROSOFT WINDOWS/386 Version 2.1

The instructions which follow are applicable to users of Microsoft Windows/386 and the VGA Adapter. Note that, to use the 800x600 and 1024x768 modes, a variable frequency ANALOG color display capable of these high resolution is required.

The VGA Driver Diskette 1 contains the high-resolution drivers, as well as a file called SETUP.INF that replaces the files of the same name on the Microsoft Windows/386 Setup, Build, and Displays 1 diskette. Follow the instructions listed below carefully to install a high-resolution driver.

Instructions:

1. Make a DISKCOPY of the Setup, Build, and Displays 1 diskette. Example (for systems with a single floppy and hard drive):

   C: >DISKCOPY A: A:

   The system will use drive A: for both the original and the copy as the source and target diskettes. are inserted alternately for the copy.

2. After the copy is made, return the original to its jacket and store safely.

3. Copy the file SETUP.INF from VGA Driver Diskette 1 to the newlycreated copy of the Setup, Build, and Displays 1 diskette. Example (for systems with a single floppy and hard drive):

   C: >COPY A:SETUP.INF B:

The system will use drive A: as drive B: also. After the copy is finished, type A: [ENTER].

4. Type SETUP [ENTER] to begin installation of Windows/386.

5. When asked if the configuration list is correct, move the cursor to the VGA selection and press [ENTER] to select from the following:

   VGA Adapter 640x450 Mode
   VGA Adapter 800x600 Mode
   VGA Adapter 1024x768 Mode

6. The program will ask you to insert the VGA Driver Diskette 1 in order to install the driver information. After this is done, the installation program will continue normally.

After you complete the above steps you can begin using Windows/386.

INSTALLING THE VGA ADAPTER 800x600 and 1024x768 DRIVERS FOR VENTURA PUBLISHER VERSIONS 1.1 – 2.0

The following instructions are applicable to users of Ventura Publisher Versions 1.1 – 2.0 and the VGA Adapter.

The enclosed Ventura 800x600 and 1024x768 driver files are installed AFTER Ventura Publisher has been installed on your system. The drivers make full use of the 800x600 or 1024x768 graphics modes of the VGA Adapter. Your VGA monitor must be capable of displaying this resolution in order to utilize this driver.

Be sure that you VGA monitor can display 800x600- and/or 1024x768-pixel resolution. Choosing a higher resolution than your monitor is capable of displaying will bring about unsatisfactory results.

To install your VGA driver, perform the following steps:

1) Follow the Ventura installation instructions.

2) When you are asked to select a video adapter, choose

   E IBM Personal System/2 (640x480) two colors. (Version 1.1)
   E IBM VGA or Compatible (640x480) 2 colors. (Version 2.0)

3) Complete Ventura Publisher installation and see that it is working properly using the installed IBM driver.

4) Exit Ventura Publisher and insert the VGA Driver Diskette in your A: drive.

5) Log on to your A: drive, e.g.:

C: >A: [ENTER]
A: >

and type VPDRV2_0 [ENTER]

6) The program will ask you some questions about your Ventura configuration. Answer them appropriately.

7) When the program asks you what display device and resolution you want to install for, make a selection,

VGA Adapter (800x600) 16 colors or greys.
VGA Adapter (1024x768) 16 colors or greys.

whichever is appropriate or desirable for your hardware configuration.

8) The program then asks for the type of mouse you have. Respond (appropriately) as you did during your initial installation.

9) Finally, the program displays the choices you have made and provides you the opportunity to change. If no change is necessary, press [ENTER] or "Y" (the default response is "Y") and the driver will be installed.

10) If you desire a change press "N" [ENTER] and make your changes.

The driver will then be installed and you can log back on to the hard disk drive and begin using Ventura.

DRIVER INSTALLATION FOR WORDPERFECT 5

The following instructions are applicable to users of WordPerfect 5.0 at 800x600 or 1024x768 resolution. Please note that, to use the 800x600 or 1024x768 mode, an ANALOG monitor or functional equivalent color monitor is required. Please be sure that your monitor is capable of displaying these resolutions in order the utilize the drivers. Choosing a higher resolution than your monitor is capable of displaying will bring unsatisfactory results.

The enclosed drivers, WP800.WPD and WP1024.WPD, are used to enable WordPerfect 5.0 to be displayed at 800x600 and 1024x768 resolution respectively. The drivers need only to be copied onto the disk directory where WordPerfect 5.0 resides. Upon loading the program the following steps should be taken to choose the resolution desired:

1. From the document screen displayed after entering WordPerfect, press SHIFT/F1 to get to the Setup menu.

2. From Setup, choose option 3-Display. This brings up the Get Setup: Display menu.

3. From the Get Setup: Display menu, choose option 5-Graphics Screen Type.

4. From the Get Setup: Graphics Screen Type menu, choose either;

VGA Adapter 800x600 16 color
or
VGA Adapter 1024x768 16 color

5. Exit from the menus and begin using WordPerfect.

GEM Version 2.1/3.1

The instructions which follow are applicable to users of GEM Version 2.2 and VGA-Ultra Graphics board. Please be sure that, to use the 800x600 and 1024x768 mode, the functional equivalent color monitor is required.

The enclosed GEM 800x600 and 1024x768 driver is named GEMSETUP.V22/V31 and replace the driver of the same name on GEM Device Driver Disk #1. The driver makes full use of the 800x600 and 1024x768 graphics modes of the VGA-Ultra Adapter.

Instructions:

1) Make a diskcopy of GEM Device Driver Disk #1. This copy will be used in place of the original during installation.

2) Copy the file GEMSETUP.V22/31 from your VGA-Ultra Utility Diskette to the newly created copy of the GEM Device Disk #1.

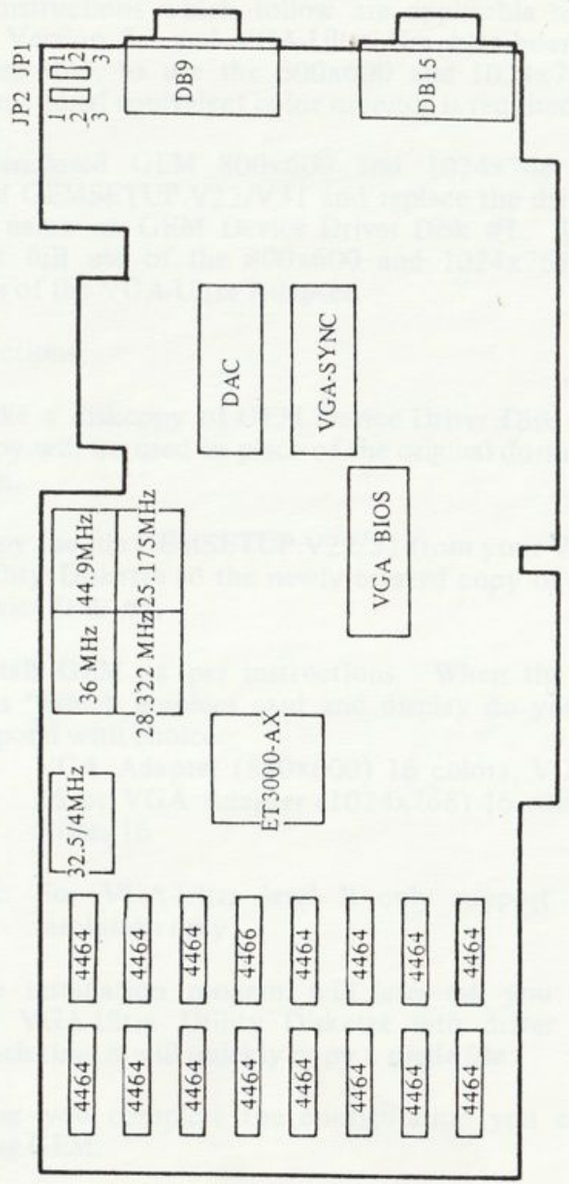
3) Install GEM as per instructions. When the program asks "Which graphics card and display do you have?", respond with choice:
   VGA Adapter (800x600) 16 colors; VGA HiRes 16 or VGA Adapter (1024x768) 16 colors; VGA HiRes 16

NOTE: For VGA-Ultra level B only support 800x600 resolution only.

4) The installation program will later ask you to insert the VGA-Ultra Utility Diskette into driver "A:" at which time it will quickly copy a single file.

5) After you complete the configuration you can begin using GEM.

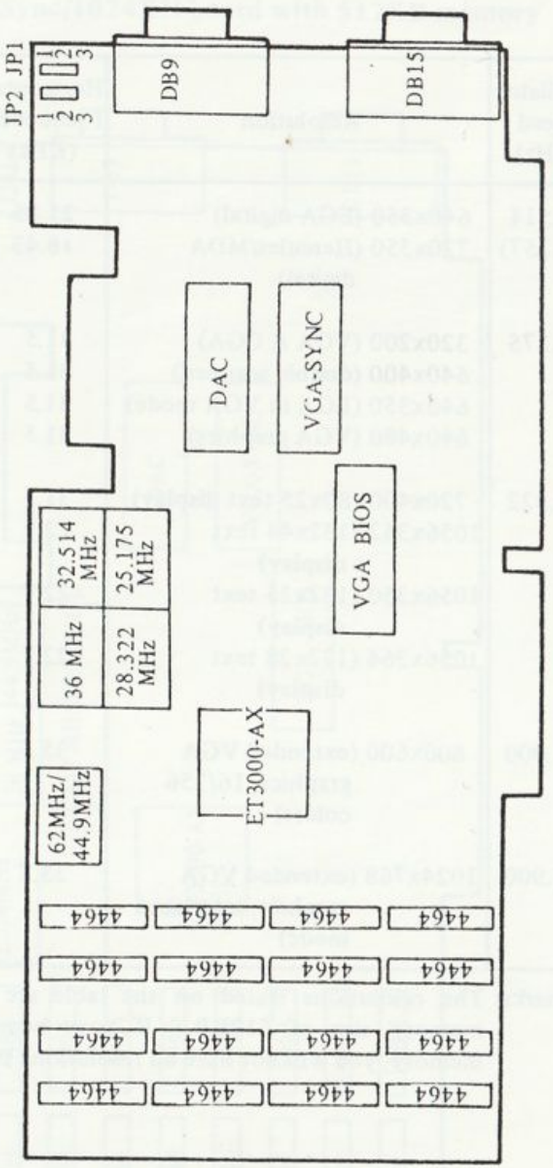
VGA-Sync/1024XN board with 512KB memory



Oscillator Speed (MHz)	Resolution	Horizontal Frequency (KHz)	Vertical Frequency (Hz)
32.514 (16.257)	640x350 (EGA digital)	21.85	60
	720x350 (Hercules/MDA digital)	18.43	50
25.175	320x200 (VGA & CGA)	31.5	70
	640x400 (double scanned)	31.5	70
	640x350 (EGA in VGA mode)	31.5	70
	640x480 (VGA graphics)	31.5	60
28.322	720x400 (80x25 text display)	31.5	70
	1056x352 (132x44 text display)	22.7	60
	1056x350 (132x25 text display)	22.7	60
	1056x364 (132x28 text display)	22.7	60
36.000	800x600 (extended VGA graphics, 16/256 colors)	35.5	56
44.900	1024x768 (extended VGA graphics, interlaced mode)	35.5	43.5

Remarks: The resolutions stated on the table are based on the memory size of 512KB. If your board has 256KB memory, you will not have all resolutions stated.

VGA-Sync/1024X board with 512KB memory



Oscillator Speed (MHz)	Resolution	Horizontal Frequency (KHz)	Vertical Frequency (Hz)
32.514	640x350 (EGA digital)	21.85	60
(16.257)	720x350 (digital Hercules/ MDA)	18.43	50
25.175	320x200 (VGA & CGA)	31.5	70
	640x400 (double scanned)	31.5	70
	640x350 (EGA in VGA mode)	31.5	70
	640x480 (VGA graphics)	31.5	60
28.322	720x400 (80x25 text)	31.5	70
	1056x352 (132x44 text)	22.7	60
	1056x350 (132x25 text)	22.7	60
	1056x364 (132x28 text)	22.7	60
36.000	800x600 (extended VGA graphics, 16/256 colors)	35.5	56
44.900	1024x768 (extended VGA graphics, interlaced mode)	35.5	43.5
62/65	1024x768 (noninterlace mode)	48.5	60

Remarks: The resolutions stated on the table are based on the memory size of 512KB. If your board has 256KB memory, you will not have all resolutions stated.

VGA-Ultra Application Notes (For Software Developers)

Using the Extended Color Graphics Modes

Introudction

Besides the standard VGA/EGA compatibility the VGA-Ultra has additional display modes. These new modes are designed to increase the resolution up to 1024x768 (when using an IBM 8514, NEC Multisync XL, or other compatible monitor).

This application note describes how to identify an VGA-Ultra, how to select the extended color modes form application programs and how these High Resolution memory maps are organized.

NOTE: For detail information please refer to next chapter "VGA-Ultra PROGRAMMER'S GUIDE".

Selecting Extended Color Graphics Modes

VGA-Ultra BIOS supports the following extended modes. The numbers are in decimal except as noted.

MODE	MODE TYPE	LENGTH OF MEMORY MAP (Each Plane)
37 HEX	Graphics	128x768 = 98304 = 18000 HEX
30 HEX	Graphics	100x600 = 60000 = EA60 HEX
2E HEX	Graphics	80x480 = 38400 = 9600 HEX

NOTE: 1) VGA-Ultra level B do not support mode 37 Hex.

2) The hi-res. modes are selected exactly as the standard modes 0-7 HEX and 0D HEX – 10 HEX are selected:

* Place a 0 in register AH to indicate "Select mode" function.
* Place the mode number in register AL.
* Execute an INT 10 instruction, generating software interrupt 10 HEX, which invokes the VGA-Ultra BIOS to set the mode.

The above calling sequence should be familiar to anyone who has ever called the BIOS from assembly language or from a machine-language driver, and is the standard BIOS interface for Video mode select.

Extended Color Graphics Memory Map

The hi-res. color graphics memory map begins at A000:0000, just like the IBM VGA/EGA 640x350 mode. As indicated in the table above, the length of the extended color graphics modes memory map is longer than the normal mode 10 HEX length.

80x60/100x40 Text Mode Memory Map

The 80x60 and 100x40 color text memory map begins at B000:0000 just like any other color text. Memory is organized with even bytes as character codes and odd bytes as attributes, again just like normal color text. As indicated in the table above, the length of the 80x60 and

100x40 color text memory map is longer than the normal mode 2 length of 4000 bytes.

Using 132, 100 & 80 Column Text Modes

This application note describes how to select the VGA-Ultra board's 132-column text modes from application programs and how the 132-column text modes memory map is organized.

Selecting 132, 100 and 80 Column Color or Monochrome Text Modes

The VGA-Ultra board BIOS supports the following 132, 100 and 80 column text modes on variable-frequency monitors. These modes are not used by the IBM EGA. 132 column modes are not supported on the IBM 8503, 8512, and 8514 analog monitors. The numbers are decimal except as noted.

Mode	ColumnsxRows	Length of Memory Map
22 HEX	132x44	132x44x2 = 11616 = 2D60 HEX
23 HEX	132x25	132x25x2 = 6600 = 19C8 HEX
24 HEX	132x28	132x28x2 = 7392 = 1CE0 HEX
*18 HEX	132x44 (Mono)	132x44x2 = 11616 = 2D60 HEX
*19 HEX	132x25 (Mono)	132x25x2 = 6600 = 19C8 HEX
*1A HEX	132x28 (Mono)	132x28x2 = 7392 = 1CE0 HEX
2A HEX	100x40	100x40x2 = 8000 = 1F40 HEX
26 HEX	80x60	80x60x2 = 9600 = 2580 HEX

* marked as 132-column monochrome modes

132-Column Text Memory Map

The 132-column color text memory map begins at B800:0000 (monochrome at B000:0000), just like any other color text. Memory is organized with even bytes as character codes and odd bytes as attributes, again just like normal color text. The row offset register (CRTC register 13 hex) is normally set to 66 (42 hex) to compensate for the greater width of the screen and so the start of each row is 264 bytes after the start of the row above it, as opposed to the 80-column row offset register of 40 (28 hex) and 160 bytes from the start of one row to the start of the next.

As indicated in the table above, the lengths of the 132-column memory maps are longer than the normal mode 2 length of 4000 bytes.

Using Hardware ZOOM and PAN Feature

The ZOOM programs once loaded are available at the software interrupt level. Several function calls have been defined that will allow you to take advantage of the hardware zoom functions in the VGA-Ultra. The function code is passed in the AX register and any parameters requested are sent via the other 8088 registers.

The interrupt number is defined at the time ZOOM is initialized and can be found by executing the following code sequence after the ZOOM programs have been made resident:

1) Assembler:

```
MOV AH, OFFH ;New Function – Query ZOOM
               Interrupt
INT 16H      ;
```

Output:

AL – Zoom interrupt vector number
AL+1 – BIOS keyboard handler interrupt vector number
BX – Hot key

NOTE: All windows and parameters are undefined until set by the programmer.

2) Lattice C

```
#include < dos.h >
q_zoom_int ( )

    union REGS in, out;

    in.x.ah = Oxff;
    int86(Ox16,&in,&out),
    return(out.x.al);
```

Once the application program has determined the interrupt number of the zoom drivers it can invoke any of the zoom functions described on the following pages.

Zoom Functions

The following is description of the zoom driver interrupt functions loaded by the ZOOM programs. A function is selected by placing the function code in the AX register and performing a software interrupt. The interrupt number is initialized at the time the ZOOM program is loaded.

a) Zoom Display

Function Code
AX = 0
Arguments
BX = Zoom factor

Description:

Zooms the display based on given zoom factor. Valid zoom factors are from 0 through 7.

Lattice C Example

```
#include < dos.h >
zoom(factor)
int factor;

    union REGS in,out;

    in.x.ax = 0;
    in.x.bx = factor;
    int86(zoom_int,&in,&out);
```

b) **Center Zoom Window**

Function code
AX = 1
Arguments
BX = x coordinate to center
CX = y coordinate to center

Description:

This function will attempt to position the zoom window in such a manner as to make the coordinates x, y appear as close to the middle of the display as possible. This is useful when using a mouse or other input device for panning and scrolling.

Lattice C Example

```
#include < dos.h >
main ( )

        zoom(2);
        while(1)

                mouse (&x,&y);
                zcenter (x,y);


zcenter(x,y)
int x,y;

        union REGS in,out;

        in.x.ax = 1;
        in.x.bx = x;
        in.x.cx = y;
        int86(zoom_int, &in, &out);
```


c) **End Zoom**

Function code
AX = 2
Argument: None

Description:

Unzooms the display and returns the window to its original.

Lattice C Example

```
#include < dos.h >
zoom_end ( )

        union REGS in,out;

        in.x.ax = 2;
        int86(zoom_int,&in,&out);
```

d) **Report Zoom**

Function Code
AX = 3
Argument: None
Return
AX = zoom factor

Description:

Returns the current zoom factor in the AX register.

Lattice C Example

```
#include < dos.h >
q_zoom

        union REGS in,out;

        in.x.ax = 3;
        int86(zoom_int,&in,&out);
        return(out.x.ax);
```

e) **Enter Specify Modes**

Function Code
AX = 4
Argument: None

Description:

This mode is entered whenever the user hits the pre-defined hot key. See the information on specify mode above.

Lattice C Example

```
#include < dos.h >
zoom_specify ( )

        union REGS in, out;

        in.x.ax = 4;
        int86(zoom_int,&in,&out);
```


f) **Query Zoom Window**

Function Code
AX = 5
Arguments
BX = Segment address of return argument array
CX = Offset address of return argument array

Description:

This function is used to find out what the current zoom window is set to. The programmer should pass the segment and offset values of a 14 byte array that will be filed as follows:

offset [0] x start of zoom window
offset [1] y start of zoom window
offset [2] x end of zoom window
offset [3] y end of zoom window
offset [4] current zoom factor
offset [5] zoom offset start x
offset [6] zoom offset start y

A programmer might use this function when multiple zoom windows may be used in an application, but the last zoom window must be preserved. The programmer can query the current zoom window, change window, and them restore the zoom window to the original settings.

Lattice C Example

```
#include < dos.h >
q_zoom_window(window)
int window [ ];
```

```
union REGS in,out;

in.x.ax = 5;
in.x.bx = getdatas ( );
        /* Date segment of window [ ] */
in.x.cx = (int)window;
int86(zoom_int,&in,&out);
```

g) **Set Zoom Window**

Function Code
AX = 6
Arguments
BX = Segment address of window coordinate array
CX = Offset address of window coordinate array

Description:

This junction will set the zoom window. The zoom window is the area of the display where zooming begins. The programmer must pass the segment and offset values of an array which contains the coordinates of the new zoom window. The format of the array should be as follows:

Offset [0] x start of zoom window
Offset [1] y start of zoom window
Offset [2] y end of zoom window
Offset [3] y end of zoom window

NOTE: The restrictions on x coordinate values described as below.

0 <= (x_zoom_end – x_zoom_start /
(x_zoom_factor +1) % (x_zoom_factor +1)

In English this means that width of the zoom window must be a multiple of the pixel replication factor.

Lattice C Example

```
#include < dos.h >
set_zoom_window(window)
int window [ ];

        union REGS in,out;

        in.x.ax = 6;
        in.x.bx = getdatas ( );
                /* Data segment of window [ ] */
        in.x.cx = (int) window;
        int86 (zoom_int, &in, &out);
```

h) **Query Application Key**

Function Code
AX = 7
Arguments: None
Returns
AX = 0/1

Description:

In specify mode the END key on the keypad has been reserved for application specific functions. The function returns the current toggle state of that key.

This key has been used in the AutoCAD driver for example, to tell the AutoCAD driver whether or not to pan and scroll using the mouse. When the value returned is a 1 the display window is left alone. When the value returned by this function is a 0 the A AutoCAD driver will invoke the center zoom window function each time a new cross-hair cursor is drawn. This has the effect of panning the display using the mouse or the keyboard.

Lattice C Example

```
#include < dos.h >
q_end_key ( )

        union REGS in,out;

        in.x.ax = 7;
        int86(zoom_int, &in, &out);
        return (out.x.ax);
```

i) **Set Zoom Offset**

Function Code
AX = 8
Arguments
BX = x start of zoom offset
CX = y start of zoom offset

Description:

This function is used to set the first byte of video memory that will appear in the upper left hand corner of the zoom window. In essence, this function controls panning and scrolling in the zoom window.

Lattice C Example

```
#include < dos.h >
zscroll (x,y)
int x, y:

        union REGS in, out;

        in.x.ax = 8;
        in.x.bx = x;
        in.x.cx = y;
        int86(zoom_int,&in,&out);
```

VGA-Ultra PROGRAMMER'S GUIDE

General Structure of VGA-Ultra

The VGA-Ultra enhanced video arrays provide enhanced graphics and test resolution and versatility. VGA-Ultra is an IBM VGA/EGA compatible adapter that provides text modes from 40x25 to 132x44, and graphics resolution from 320x200 to 1024x768. Colors can be selected from a palette of 256K, displaying up to 256 simultaneously in some modes using an analog display.

VGA-Ultra memory is organized in four planes, except in 256-color modes which are linear byte-mapped, and is mapped into CPU memory space. The beginning address of memory is dependent upon the mode selected. Modes 0-6, 22-24, 26 & 2A are mapped at segment B800. Modes 7, 18, 19 & 1A are mapped at segment B000, and all other modes D-13, 25, 29, 2D, 2E, 30 & 37 are mapped at segment A000.

PS: The numbers in mode, segment and address are described by Hex-decimal except as notes.

The internal color palette of the VGA-Ultra contains 16 color registers containing 6 bits each. These six bits represent 2 bits each for the primary colors of red, green and blue. Since each pixel actually represents 4 bits (one for each of the four planes), a 4-bit word is used to address any one of the 16 color registers. Bit 0 of the four-bit address corresponds to plane 0, and so on. The colors are determined by the value in a register set by in index address. Therefore, a maximum of 16 colors can be displayed at one time while the palette which has 256 entries (most modes use only the lower 64).

A standard set of modes exists for the VGA-Ultra. These modes are alphanumeric (A/N), or text, and all-points-

addressable (APA), or graphics. Accessing these modes is done through interrupter 10 and each mode is assigned a unique value for identification. While the specifications for these modes are given as a standard, alterations to the modes may be performed in order to create new modes. In doing so, consideration should be given to the capabilities of the display device and the design of the adapter as caution must be given to potential damage to the devices.

Hi-Res. modes (>= 640x480) can only be activated using multi-frequency monitors or those compatible with the IBM 85xx series displays. Invoking Hi-Res. modes either alphanumeric or all-points-addressable. Alphanumeric modes transfer characters using fonts stores in plane 2. Character attributes information is stored in plane 1, and character data is stored in plane 0. All four planes are available for data in APA modes so that both graphic and textual information can be stored and is displayable in all graphics modes, while only text is available in A/N modes.

Text and graphics modes operate in a completely different fashion. While graphics are produced by addressing each pixel to be displayed, A/N characters are generated and stored in character sets which are then loaded into display memory plane 2. This plane is then unlatched from the color output drivers. Eight character sets can simultaneously be stored in the VGA-Ultra.

Normal IBM-specified VGA resolution is 720x400 (HxV) screen pixel matrix. In an 80x25 (ColumnxRow) text mode, each character would therefore be 16 rows high. Characters are normally 8 to 9 pixels wide and standard fonts are set at 8x8 and 8x14 or 9x14. These sizes have evolved as the standard purely for legibility in viewing the standard IBM character set. However, different "soft fonts" are downloadable and may use a smaller character cell in order to produce more characters on a single screen. Soft fonts are those which are loaded into video RAM

and remain displayable in most applications, but cannot be output for hardcopy reproduction.

The VGA-Ultra, like the IBM EGA, has many specialized registers to perform functions such as timing states, data access to video memory, screen resolution, etc. Some of these registers are indexed registers; registers in which only two port addresses are used (an index port and a data port), even though there may be many actual registers. These indexed registers are accessed by writing the index value to the index register and then writing the data value to the data register. For example, to enable all planes for writing (in graphics mode), the following code writes a '0F Hex' to index 2 (write map mask) of the timing sequencer:

```
mov  dx,03c4h    ; timing sequencer = 03c4 Hex
mov  al,02       ; index 2
out  dx,al       ; write index
inc  dx          ; data is at index+1 03c5 Hex
mov  al,0fh      ; value to write
out  dx,al
```

Note: Since Intel 8088/86 instruction set contains a word out that writes the low address first, the following code will do the same function:

```
mov  dx,03c4h    ; timing sequencer
mov  dx,0f02h    ; index = 2, data = 0f Hex
out  dx,ax       ; value to write
```

Many functions may be implemented by writing values directly to the registers, but the common and easiest (and recommended) method of programing the adapter for functions, such as mode changes, palette settings, cursor position reading, and the like is to use the BIOS routines accessed through interrupt 10 Hex. While this method is easy for these operations, it is not recommended for writing graphics data as that is a too slow process.

As with the IBM EGA, The VGA-Ultra ROM BIOS is found at segment C000. However, it is twice the size 32KB versus 16KB. The ROM contains a set of instructions, firmware, that is accessible through software interrupt 10h. Setting a value for a predetermined function in the AH register will cause the BIOS to execute particular functions.

VGA-Ultra BIOS INT 10H FUNCTION TABLE

(AH)	Function
00H	Mode Set
01H	Set Cursor Type
02H	Set Cursor Position
03H	Read Cursor Position
04H	Read Light Pen Position (not supported by VGA-Ultra)
05H	Select Active Display Page
06H	Scroll Active Page Up
07H	Scroll Active Page Down
08H	Read Character at Current Cursor Position
09H	Write Character(s) at Current Cursor Position
0AH	Write Character(s) Only at Current Cursor Position
0BH	Set Color Palette
0CH	Write Dot
0DH	Read Dot
0EH	Write Teletypewriter (TTY) to Active Page
0FH	Return Current Video State
10H	Set Palette Registers
11H	Character Generator Routine
12H	Alternate Select
13H	Write String
1AH	Display Combination Code
1BH	Return functionality/State Information
1CH	Save/Restore

NOTE: 1) Functions 14H through 19H are reserved.
2) All values in Hex-decimal unless otherwise noted.

VGA-Ultra BIOS Function Calls Description

1) AH = 0

Function: set video mode.
Input:
AL = mode to set (see table below).
Output: none.

NOTE: If bit 7 of AL is 1, then the re-generate buffer is not cleared in modes driven by the VGA-Ultra board-modes driven by pass through to BIOS may be cleared.

The VGA-Ultra Mode Description Table

Mode	Description
00h	A/N 40x25 text, color [CGA disabled color burst]
01h	A/N 40x25 text, color
02h	A/N 80x25 text, color [CGA disabled color burst]
03h	A/N 80x25 text, color
04h	APA 320x200 graphics, 4 color
05h	APA 320x200 graphics, 4 color [CGA disabled color burst]
06h	APA 640x200 graphics, 2 color
07h	A/N 80x25 text, monochrome attributes
0Bh	reserved
0Ch	reserved
0Dh	APA 320x200 graphics, 16 color
0Eh	APA 640x200 graphics, 16 color
0Fh	APA 640x350 graphics, monochrome
10h	APA 640x350 graphics, 16 color
11h	APA 640x480 graphics, 2 color, VGA display
12h	APA 640x480 graphics, 16 color, VGA display
13h	APA 320x200 graphics, 256 color, VGA display
18h	A/N 132x44 text, 8x8 font, monochrome
19h	A/N 132x25 text, 8x14 font, monochrome
1Ah	A/N 132x28 text, 8x13 font, monochrome
22h	A/N 132x44 text, 8x8 font, color

The VGA-Ultra Mode Description Table (Continued)

Mode	Description
23h	A/N 132x25 text, 8x14 font, color
24h	A/N 132x28 text, 8x13 font, color
25h	APA 640x480 graphics, color, VGA/multisync display
26h	A/N 80x60 text, 8x8 font, color, VGA/multisync display
29h	APA 800x600 graphics, 16 color, multisync display
2Ah	A/N 100x40 text, 8x15 font, color, multisync display
2Dh	APA 640x350 graphics, 256 color
2Eh	APA 640x480 graphics, 256 color
30h	APA 800x600 graphics, 256 color
37h	APA 1024x768 graphics, 16 color, hires displays

CAUTION: VGA-Ultra level B do not support 640x350/256 colors, 640x480/256 colors, 800x600/256 colors and 1024x768/16 colors operation. If you select these modes it will hang up your system.

The VGA-Ultra Mode Information Table

Mode	Type	Colors/ Shades	Alpha Format	Buffer Start	Box Size	Max. Pages	Display Size
00h	A/N	16/256K	40x25	B8000	8x 8	8	320x200
*00h	A/N	16/256K	40x25	B8000	8x14	8	320x350
+00h	A/N	16/256K	40x25	B8000	9x16	8	360x200
01h	A/N	16/256K	40x25	B8000	8x 8	8	320x200
*01h	A/N	16/256K	40x25	B8000	8x14	8	320x350
+01h	A/N	16/256K	40x25	B8000	9x16	8	360x400
02h	A/N	16/256K	80x25	B8000	8x 8	8	640x200
*02h	A/N	16/256K	80x25	B8000	8x14	8	640x350
+02h	A/N	16/256K	80x25	B8000	9x16	8	720x400
03h	A/N	16/256K	80x25	B8000	8x 8	8	640x200
*03h	A/N	16/256K	80x25	B8000	8x14	8	640x350
+03h	A/N	16/256K	80x25	B8000	8x16	8	720x400
04h	APA	4/256K	40x25	B8000	8x 8	1	320x200
05h	APA	4/256K	40x25	B8000	8x 8	1	320x200
06h	APA	2/256K	80x25	B8000	8x 8	1	640x200
07h	A/N	4	80x25	B0000	9x14	8	720x350
+07h	A/N	4	80x25	B0000	9x16	8	720x400
0Dh	APA	16/256K	40x25	A0000	8x 8	8	320x200
0Eh	APA	16/256K	80x25	A0000	8x 8	4	640x200
0Fh	APA	4	80x25	A0000	8x14	2	640x350
10h	APA	16/256K	80x25	A0000	8x14	2	640x350
11h	APA	2/256K	80x30	A0000	8x16	1	640x480
12h	APA	16/256K	80x30	A0000	8x16	1	640x480
13h	APA	256/256K	40x25	A0000	8x 8	1	320x200

The VGA-Ultra Mode Information Table (Continued)

Mode	Type	Colors/ Shades	Alpha Format	Buffer Start	Box Size	Max. Pages	Display Size
18h	A/N	4	132x44	B0000	9x 8	2	1188x352
19h	A/N	4	132x25	B0000	9x14	4	1188x350
1Ah	A/N	4	132x28	B0000	9x13	4	1188x364
22h	A/N	16/256K	132x44	B8000	9x 8	2	1188x352
23h	A/N	16/256K	132x25	B8000	9x14	4	1188x350
24h	A/N	16/256K	132x28	B8000	9x13	4	1188x364
25h	APA	16/256K	80x60	A0000	8x 8	1	640x480
26h	A/N	16/256K	80x60	B8000	8x 8	3	640x480
29h	APA	16/256K	100x37	A0000	8x16	1	800x600
2Ah	A/N	16/256K	100x40	B8000	8x15	4	800x600
2Dh	APA	256/256K	80x25	A0000	8x14	1	640x350
2Eh	APA	256/256K	80x30	A0000	8x16	1	640x480
30h	APA	256/256K	100x37	A0000	8x16	1	800x600
37h	APA	256/256K	128x48	A0000	8x16	1	1024x768

NOTE: 1) A/N = Alphanumeric modes (text).

2) APA = All Points Addressable modes (graphics).

3) * Extended Graphics text modes with 350 scan lines.

4) + 9x16 character cell enhanced text modes with 400 scan lines.

5) There are a number of distinct text modes available including 132-column monochrome text modes.

6) Default modes are +03h for color monitor and +07h for monochrome monitor.

7) Mode 0-6 emulate IBM Color Graphics Adapter support.

8) Mode 0, 2 & 5 are identical to mode 1, 3 & 4 respectively.

9) There is no hardware cursor in graphics (APA) modes. Altering the hardware cursor type has no effect in these modes.

10) Selecting the number of scan lines in alphanumeric modes is detailed under "(BL) = 30 Hex, Select Scan Lines for A/N Modes."

11) The equipment flags at address 0040:0010 determine which modes are available:

* Binary XX11 XXXX (Monochrome) allows modes Hex 07h and 0Fh.
* Binary XX01 XXXX (40 Columns, Color) allows modes hex 0, 1, 4, 5, D & 13.
* Binary XX10 XXXX (80 Columns, Color) allows all other modes.

Before changing modes, the equipment flag must be set to the appropriate value for the new mode.

2) AH = 1

Function: set cursor type (start and stop scan lines)
Input:
CH = start scan line for cursor.
CL = end scan line for cursor.
Output: none.

NOTE: Only bits 0 through 4 should be set.

3) AH = 2

Function: set cursor position.
Input:
BH = page for which cursor is to be set.
DH = row position cursor is to be set to.
DL = column position cursor is to be set to.
Output: none.

NOTE: (0,0) is upper left of screen.

4) AH = 3

Function: read cursor position.
Input:
BH = page for which cursor is to be read.
Output:
CH = current start scan line for cursor.
CL = current stop scan line for cursor.
DH = row position of cursor in selected page.
DL = column position of cursor in selected page.

5) AH = 4

Function: read light pen position.
Input: none.
Output:
AH = 0 then light pen switch not activated, return values invalid.
1 then light pen switch activated, valid values returned.
BX = pixel column.
CH = raster line.
CX = raster line (new graphics modes).
DH = row of character light pen position.
DL = column of character light pen position.

6) AH = 5

Function: select active page.
Input:
AL = page to select as active page.
Output: none.

7) AH = 6

Function: scroll up active page.
Input:
AL = number of lines rows are to move up.
0 means blank window.
BH = attribute used to fill blank line or lines at bottom.
CH = row of upper left corner of scroll window.
CL = column of upper left corner of scroll window.
DH = row of lower right corner of scroll window.
DL = column of lower right corner of scroll window.
Output: none.

8) AH = 7

Function: scroll down active page.
Input:
AL = number of lines rows are to move down.
0 means blank window.
BH = attribute used to fill blank line or lines at top.
CH = row of upper left corner of scroll window.
CL = column of upper left corner of scroll window.
DH = row of lower right corner of scroll window.
DL = column of lower right corner of scroll window.
Output: none.

9) AH = 8

Function: read character and attribute at cursor position.
Input:
BH = page to read from.
Output:
AH = attribute of character at cursor position.
AL = character read from cursor position.

NOTE: Attribute valid in text modes only. Only characters drawn with black background matched in graphics modes.

10) AH = 9

Function: write character and attribute at cursor position.
Input:
AL = character to write at cursor position.
BH = page to write character and attribute to.
BL = attribute to write character with in text mode.
= foreground color in graphics mode.
CX = number of times to write character and attribute.
Output: none.

NOTE: 1) If bit 7 of BL is 1 in graphics mode, then the character is XOR'd into video memory, else the character displaces the previous contents of video memory. (XOR not valid in 256 color modes.)

2) In 256 color modes, the value passed in BH is used as the background color.

11) AH = 0A

Function: write character only at cursor position.
Input:
AL = character to write at cursor position.
BH = page to write character and attribute to.
BL = (in graphics modes only) foreground color for character.
CX = number of times to write character and attribute.
Output: none.

NOTE: See notes for function AH=9 above.

12) AH = 0B

Function: color select for color/graphics adapter compatible modes.
Input:
BH = 0 means set the background color specified by BL.
<>0 means set the palette specified by BL.
BL = color value to be used:

* When setting the background color, BL selects any of the 16 colors with a value of 0-15 with bits 0-3.
* When selecting the palette, BL operates as follows:
bit 0=0 selects palette 0 (green/red/brown).
bit 0=1 selects palette 1 (cyan/magenta/white).

Output: none.

NOTE: 1) In text modes, the set background function sets the border color only. In graphics modes, the set background function sets both the border and background colors.

2) This function is implemented via emulation, since the EGA does not have the same color registers as the color/graphics adapter.

3) Actual operation is to set palette register 0 for background, palette register 11h for overscan, and palette registers 1-3 for palette colors 1-3. Palette registers are set in any graphics mode, although this was valid only in 320x200 graphics mode on the color/graphics adapter.

13) AH = 0C

Function: draw graphics pixel.
Input:
AL = color (actually attribute that goes to the palette RAM) to draw pixel in.
BH = page to draw pixel in.
CX = screen (scanline) column to write pixel at.
DX = screen (scanline) row to write pixel at.
Output: none.

NOTE: If bit 7 of AL is 1, then the pixel is XOR'd with the contents of video memory (except in 256 color modes).

14) AH = 0D

Function: read graphics pixel color (actually attribute that goes to the palette RAM).
Input:
BH = page to read pixel from.
CX = screen (scanline) column to read pixel from.
DX = screen (scanline) row to read pixel from.
Output:
AL = pixel value read (attribute of pixel).

NOTE: Interpretation of value returned depends on graphics mode in effect.

15) AH = 0E

Function: write TTY on active page.
Input:
AL = character to write.
BL = color to draw character in graphics mode.
Output: none.

NOTE: Carriage return, backspace, line feed, bell are commands, not displayed characters. Cursor is moved to the right after character is displayed, with wrap and scroll at right margin of screen.

16) AH = 0F

Function: return video information.
Input: none.
Output:
AL = video mode in effect.
AH = text columns supported in current mode.
BH = active display page.

NOTE: Bit 7 of AL is set to 1 if the re-generate buffer is not to be cleared when the mode is set.

17) AH = 10

Function: set internal palette registers.

a) AL = 0 set color for a single palette register.

Input:
BH = color to set palette register to.
BL = palette register to set color of.
Output: none.

b) AL = 1 set color for overscan (border color) register.

Input:
BH = color to set overscan register to.
Output: none.

c) AL = 2 set colors for all 16 palette and the overscan registers.

Input:
ES:DX = address of table organized as follows:
bytes 0-15 = colors for palette registers 0-15.
byte 16 = color for overscan register.
Output: none.

d) AL = 3 select interpretation of intensity/blink attribute bit.

Input:
BL = 0 select high intensity background.
1 select blinking.
Output: none.

e) AL = 4-6 reserved.

f) AL = 7 read individual palette register (VGA only).

Input:
BL = palette register to read (range 0 to 15)
Output:
BH = value read

g) AL = 8 read overscan register (VGA only).

Input: none
Output:
BH = value read.

h) AL = 9 read all palette registers and overscan (VGA only).

Input:
ES:DX points to 17 byte table area.
Output:
bytes 0-15 = palette values.
byte 16 = overscan value.

i) AL = 10h set individual color register (external palette) (VGA only).

Input:
BX = color register to set.
DH = red value to set
CH = green value to set
CL = blue vaue to set.
Output: none.

j) AL = 11 reserved.

k) AL = 12 set block of color registers (VGA only)

Input:
ES:DX = pointer to table of color values in RGB format (i.e. 3 bytes for each entry).
BX = starting index.
CX = number of color registers to set.
Output: none.

l) AL = 13 select color page (VGA only).

i) BL = 00 select paging mode

Input:
BH = paging mode
0 – selects 4 register blocks of 64 registers
1 – selects 16 register blocks of 16 registers.

Output: none.

ii) BL = 01 select page.

Input:
BH = page value (0 to nn).

NOTE: Where nn = 3 in page mode 0 & nn = 15 in page mode 1).

m) AL = 14 reserved.

n) AL = 15 read individual color register (VGA only).

Input:
BX = color register to read.
Output:
DH = red value read.
CH = green value read.
CL = blue value read.

o) AL = 16 reserved.

p) AL = 17 read block of color registers (VGA only).

Input:
ES:DX = pointer to destination for RGB table (3 bytes/entry).
BX = starting index.
CX = number of color registers read.
Output:
(ES:DX) = table.

q) AL = 18-19 reserved.

r) AL = 1A read color page state (VGA only).

Input: none.
Output:
BL = current paging mode.
BH = current page.

s) AL = 1B sum colors to gray shades (VGA only).

Input:
BX = starting index.
CX = number of color registers to sum.

NOTE: This call reads R, G, and B values found in external palette ram and performs a weighted sum (30% red, 59% green, and 11% blue), then writes the result into each R, G, and B component of color register (original data is over-written).

18) AH = 11 font interface.

a) AL = 0 load user font into soft font (text mode).

Input:
BH = # of bytes per character.
BL = # of soft font to load font into.
CX = # of characters to store.
DX = offset into table of first character to store.
ES:BP = pointer to font to load.
Output: none.

b) AL = 1 load ROM monochrome font into soft font (text mode.)

Input:
BL = # of soft font to load font into.
Output: none.

c) AL = 2 load ROM 8x8 double dot font into soft font (text mode.)

Input:
BL = # of soft font to load font into.
Output: none.

d) AL = 3 select fonts displayed (text mode).

Input:
BL = specification for high/low attribute bit 3:

NOTE: Bits 4, 1, 0 = soft font # selected when attribute bit 3 is 0.
Bits 5, 3, 2 = soft font # selected when attribute bit 3 is 1.

Output: none.

NOTE: The following functions AL=1X are the same as AL=0X, except:

* The active page must be zero.

* The char_height variable will be re-calculated.

* The crt_rows variable will be re-calculated as:
INT ((200 | 350 | 400) / char_height) – 1

* Re-generate_length will be re-calculated as:
(crt_rows + 1) * crt_columns * 2

* The CRTC will be re-programmed as:
Max scan line = char_height – 1
Cursor start = char_height – 2
Cursor end = char_height – 1
(cursor_type set via set_cursor_type BIOS function)
Vertical display end =
((crt_rows + 1) * char_height) – 1
[char_height * 2 above if double scan]
Underline = char_height – 1 (monochrome mode)

e) AL = 4 load ROM 8x16 font into soft font (text mode.)

Input:
BL = # of soft font to load font into.
Output: none.

f) AL = 10 load user font into soft font (text mode).

Input:
BH = # of bytes per character.
BL = # of soft font to load font into.
CX = # of characters to store.
DX = offset into table of first character to store.
ES:BP = pointer to font to load.
Output: none.

g) AL = 11 load ROM monochrome font into soft font (text mode).

Input:
BL = # of soft font to load font into.
Output: none.

h) AL = 12 load ROM 8x8 double dot font into soft font (text mode).

Input:
BL = # of soft font to load font into.
Output: none.

i) AL = 14 load ROM 8x16 font into soft font (text mode).

Input:
BL = # of soft font to load font into.
Output: none.

j) AL = 20 set user font chars 128-255 for color/ graphics adapter compatible modes (graphics).

Input:
ES:BP = pointer to font to load.
Output: none.

k) AL = 21 set user font (graphics).

Input:
BL = # of rows on screen, as follows:
0 then DL = user specified # rows.
1 then 14 rows.
2 then 25 rows.
3 then 43 rows.
CX = character height.
ES:BP = pointer to font to load.
Output: none.

l) AL = 22 set ROM 8x14 font (graphics).

Input:
BL = # of rows on screen, as follows:
0 then DL = user specified # rows.
1 then 14 rows.
2 then 25 rows.
3 then 43 rows.

m) AL = 23 set ROM 8x8 double dot font (graphics).

Input:
BL = # of rows on screen, as follows:
0 then DL = user specified # rows.
1 then 14 rows.
2 then 25 rows.
3 then 43 rows.

n) AL = 24 set ROM 8x16 font (graphics).

Input:
BL = # of rows on screen, as follows:
0 then DL = user specified # rows.
1 then 14 rows.
2 then 25 rows.
3 then 43 rows.

o) AL = 30 return font information.

Input:
BH = 0 return pointer to upper 128 graphics characters (INT 01Fh pointer-color/ graphics adapter compatible modes).
BH = 1 return pointer to graphics font (INT 043h pointer).
BH = 2 return pointer to ROM 8x14 font.
BH = 3 return pointer to ROM 8x8 double dot font.
BH = 4 return pointer to top half of ROM 8x8 double dot font.
BH = 5 return pointer to ROM font supplement for 9x14 text.
BH = 6 return pointer to ROM 8x16 font.
BH = 7 return pointer to ROM font supplement for 9x16 text.
Output:
CX = char_height.
DL = crt_rows.
ES:BP = pointer to table selected by BH.

19) AH = 12 return EGA information or select options.

a) BL = 10 return information.

Input: none.
Output:
BH = 0 a color mode is active (addressed at 03DX).
= 1 a monochrome mode is active (addressed at 03BX).

BL = installed video memory on EGA board, as follows:
0 = 64K bytes.
1 = 128K bytes.
2 = 192K bytes.
3 = 256K (or more) bytes.
CH = feature bits (bits 4-7 of info_1 shifted right).
CL = switches (bits 0-3 of info_1).

b) BL = 20 select this BIOS's print screen routine, which supports all modes of this BIOS.

Input: none.
Output: none.

NOTE: This function selects the print screen routine built into this ROM to replace the standard BIOS print screen routine.

c) BL = 30 select scan lines for text modes.

Input:
AL = scan lines to set
(takes effect on next mode change)
0 = 200 scan lines.
1 = 350 scan lines.
2 = 400 scan lines.
Output:
AL = 12h.

d) BL = 31 select whether palette registers are to be load with default values or left unchanged during subsequent mode sets.

Input:
AL = 0 enable palette loading.
AL = 1 disable palette loading
Output:
AL = 12h.

e) BL = 32 enable or disable the video adapter.

Input:
AL = 0 enable / AL = 1 disable.
Output:
AL = 12h.

f) BL = 33 enable or disable summing color values to a gray scale during subsequent mode sets or calls to set the color registers.

Input:
AL = 0 enable summing.
AL = 1 disable summing.
Output:
AL = 12h.

g) BL = 34 enable or disable summing color values to a gray scale during subsequent mode sets or calls to set the color registers.

Input:
AL = 0 enable summing.
AL = 1 disable summing.
Output:
AL = 12h.

h) BL = 35 switch between adapter and motherboard video functions (not currently implemented or needed).

Input:
AL = 0 initial switch off adapter.
AL = 1 initial switch on motherboard.
AL = 2 switch off active display.
AL = 2 switch on inactive display.
ES:DX = pointer to 128-byte buffer.
Output:
AL = 12h.

i) BL = 36 enable or disable video output.

Input:
AL = 0 enable video output.
AL = 1 disable video output
Output:
AL = 12h.

20) AH = 13 write text string.

Input:
AL = 0 text string is characters only. Cursor not moved from original position.
BL = attribute to write text string with.

NOTE: Where BL = # as follows:

= 1 text string is characters only. Cursor moved to end of text string.
2 text string is alternating character/attribute sequence. Cursor not moved from original position.
3 text string is alternating character/attribute sequence. Cursor moved to end of text string.

BH = page to write text string to.
CX = count of characters (not bytes) in string to display.
DH = row position at which to start displaying string.
DL = column position at which to begin displaying string.
ES:BP = pointer to text string to be written.

NOTE: Scroll, backspace, carriage return, if any, will take place in the active page only.

21) AH = 1A read/write display code function.

Display combination codes:

00 – No display
01 – Monochrome with 5151
02 – CGA with 5153/4
03 – Reserved
04 – EGA with 5153/4
05 – EGA with 5151
06 – Professional Graphics System with 5175
07 – VGA with analog B&W
08 – VGA with analog color
09 – Reserved
0A – System 30 with 5153/4
0B – System 30 with analog B&W
0C – System 30 with color
0D to FE – Reserved
FF – Unknown

a) AL = 0 read display code

Input: none.
Output:
AL = 1Ah.
BL = Active display code.
BH = Alternate display code.

b) AL = 1 write display code.

Input:
BL = Active display code.
BH = Alternate display code.
Output:
AL = 1Ah.

22) AH = 1B return function/state information

Input:
BX = implementation type (0)
ES:DI = buffer (40h bytes)
Output:
AL = 1Bh.

Buffer, in the following format:

offset	type	description
00	word	Offset to static function information
02	word	Segment to static function information
04	byte	Video mode
05	word	Number of columns on screen
07	word	Length of re-generate buffer
09	word	Start address of re-generate buffer (offset)
0B	*word	Cursor position for 8 pages (row, column)
1B	word	Cursor mode setting (start, end)
1D	byte	Active page
1E	word	CRTC address
20	byte	Current setting of 3x8 register (mode register)
21	byte	Current setting of 3x9 register
22	byte	Rows on screen
23	word	Character height
25	byte	Active display combination code
26	byte	Alternate display combination code
27	word	Colors supported for current video mode
29	byte	Display pages supported for current video mode
2A	byte	Scan lines in current video mode 0 = 200 1 = 350 2 = 400 3 = 480 4 = reserved (512 if applicable) 5 = 600 (note: IBM reserves this) 6 = 768 (note: IBM reserves this) 7 – 255 = reserved

offset	type	description (Continue)
2B	byte	Primary character block 0 = block 0 1 = block 1 • • • 255 = block 255
2C	byte	Secondary character block
2D	byte	Miscellaneous state information 0 – 1 = all modes on all monitors active 1 – 1 = summing active 2 – 1 = adapter set for monochrome 3 – 1 = mode set default palette loading disabled 4 – 1 = cursor emulation active 5 – 0 = background intensity / 1 = blinking 6 7 – reserved
2E	byte	Reserved
2F	byte	Reserved
30	byte	Reserved
31	byte	Video memory available 0 = 64Kb 1 = 128Kb 2 = 192Kb 3 = 256Kb 4 – 255 = reserved
32	byte	Save pointer state information 0 – 512 character set active 1 – dynamic save area active 2 – alpha font override active 3 – graphics font override active 4 – palette override active 5 – DCC extension active 6 7 – reserved
33-3F	byte	Reserved

Format of static function table:

bit flags: 0 = not supported / 1 = supported

offset	type	description
00	byte	Video modes 0 – mode 0 1 – mode 1 2 – mode 2 3 – mode 3 4 – mode 4 5 – mode 5 6 – mode 6 7 – mode 7
01	byte	Video modes 0 – mode 8 1 – mode 9 2 – mode A 3 – mode B 4 – mode C 5 – mode D 6 – mode E 7 – mode F
02	byte	Video modes 0 – mode 10 1 – mode 11 2 – mode 12 3 – mode 13 4 5 6 7 – reserved
03	byte	Video modes (IBM reserves this) bits 0-7 = modes 18-1F
04	byte	Video modes (IBM reserves this) bits 0-7 = modes 20-27
05	byte	Video modes (IBM reserves this) bits 0-7 = modes 28-2F
06	byte	Video modes (IBM reserves this) bits 0-7 = modes 30-37

offset	type	description (Continue)
07	byte	Scan lines available in text mode 0 – 200 scan lines 1 – 350 scan lines 2 – 400 scan lines 3 4 5 6 7 – reserved
08	byte	Character blocks available in text mode
09	byte	Maximum number of active character blocks in text modes
0A	byte	Miscellaneous functions 0 – all modes on all monitors 1 – summing 2 – character font loading 3 – mode set default palette loading 4 – cursor emulation 5 – EGA palette 6 – color palette 7 – color paging
0B	byte	Miscellaneous functions 0 – light pen 1 – save/restore 2 – background intensity / blinking control 3 – DCC 4 5 6 7 – reserved
0C	byte	Reserved
0D	byte	Reserved
0E	byte	Save pointer functions 0 – 512 character set 1 – dynamic save area 2 – alpha font override 3 – graphics font override 4 – palette override 5 – DCC extension 6 7 – reserved
0F	byte	Reserved

23) AH = 1C save/restore video state.

a) AL = 0 return save/restore state buffer size.

Input:
CX = requested states.
Output:
AL = 1Ch.
BX = # of 64 byte blocks needed for save buffer.

b) AL = 1 – save state.

Input:
CX = requested states.
ES:BX = pointer to save area.
Output:
(ES:BX) area modified.
AL = 1Ch.

c) AL = 2 – restore state

Input:
CX = requested states.
ES:BX = pointer to save area.
Output:
AL = 1Ch.

NOTE: Requested states in CX – defined as follows:
bit 0 = 1 – save/restore video hardware state.
bit 1 = 1 – save/restore video bios data area.
bit 2 = 1 – save/restore video external palette.
bits 3-F = reserved.

IN CASE OF DIFFICULTY

If you have problems after installation, one of the following is most probably the cause.

a. Ensure that all cables are properly connected, and that all plugs are firmly seated in their sockets.

b. Ensure that the display monitor is properly connected and that its power is turned on.

Power OFF the computer system and all other connected devices before checking the following:

c. Ensure that the switches on the VGA-Sync board are set properly and that the board is seated in the expansion slot.

d. Ensure that the system motherboard switches/ jumper(s) are set properly for use with the VGA-Sync board.

e. Ensure that no other switch settings on the motherboard have been accidentally changed. Refer to the documentation provided with your computer to determine the correct switch settings.

If checking these items does not locate the problem, there may be a malfunction of the computer system, display monitor or the VGA-Sync board. Please fill-in the Problem Report Form on the next page to assist your computer Dealer in locating the problem.

PROBLEM REPORT FORM

DATE: _____

COMPANY: _____ PHONE: _____

CONTACT: _____ FAX: _____

INFORMATION ON PURCHASED VIDEO BOARD:

BOARD MODEL: _____ PART NO. _____ REV. _____

OSCILLATORS ON BOARD: (MHZ)

____32.514 ____25.175 ____28.322 ____36.0 ____44.9 ____65.0

MEMORY SIZE ON BOARD: _____ 512KB _____ 256KB

VIDEO BIOS DATE: _____ VGA-SYNC DATE: _____

DIP-SWITCH SETTING: SWITCH 1 _____ ON _____ OFF
SWITCH 2 _____ ON _____ OFF
SWITCH 3 _____ ON _____ OFF
SWITCH 4 _____ ON _____ OFF

JUMPER SETTING: JP1 _____ 1 & 2 _____ 2 & 3
JP2 _____ 1 & 2 _____ 2 & 3

INFORMATION ON COMPUTER SYSTEM:

COMPUTER TYPE: _____ PC _____ PC/XT _____ PC/AT
_____ 386 _____ PS/2 MODEL _____
OTHER: _____ MODEL: _____

CPU CHIP SET: _____

CPU SPEED: _____ BUS SPEED: _____

WAIT-STATE: _____

PROBLEM EXISTS AT 8 MHZ, 0-WAITSTATE? ____YES ____ NO

BIOS AUTHOR: _____ VERSION: _____

DISPLAY MONITOR:

TYPE: _____ MODEL: _____ TTL: _____ ANALOG: _____

TYPE: _____ MODEL: _____ TTL: _____ ANALOG: _____

(Fill in both if you connect 2 monitors to the VGA-Sync).

ADD-IN BOARDS:

OTHER GRAPHICS BOARD _____

MEMORY BOARD _____

MULTIFUNCTION BOARD _____

LAN BOARD _____

OTHER _____

SOFTWARE INFORMATION:

OPERATING SYSTEM (version):

MS-DOS _____ PC-DOS _____ OS/2 _____

XENIX _____ OTHERS: _____

APPLICATION SOFTWARE:

_____ VERSION: _____

_____ VERSION: _____

_____ VERSION: _____

PROBLEM DESCRIPTION:

_____

_____

_____

(If problem is intermittent, please state so)

Does the same problem exist in other computers made by different manufacturer using different BIOS? _____ Yes _____ No

Does the same problem exist with other VGA-Sync boards or other VGA boards? _____ Yes _____ No