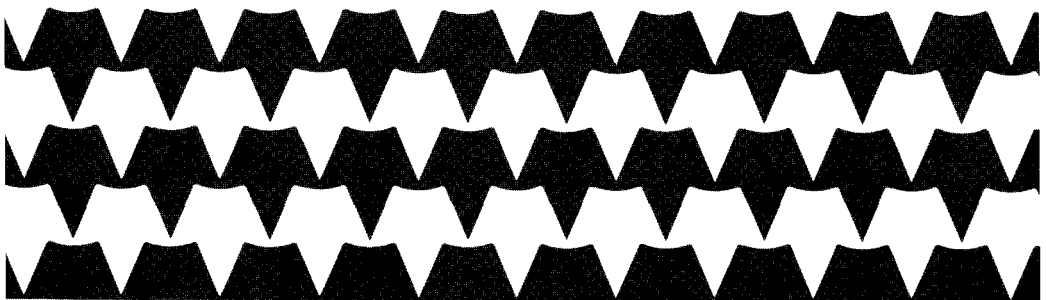


Tandy 3000/4000

EGA/CGA Graphics Adapter Installation Manual



The FCC wants you to know . . .

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EGA/CGA GRAPHICS ADAPTER

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CONTENTS

Hardware/Installation

| | |
|--|----|
| Introduction | 1 |
| Hardware Components | 2 |
| Selecting a Default Video Mode | 3 |
| Idle Switch Setting | 5 |
| Video Card Compatibility Chart | 6 |
| Monitor/Mode Compatibility Chart | 7 |
| Computer Settings | 8 |
| Installation Procedure | 9 |
| Screen Resolution | 9 |
| Utility Diskette | 10 |
| INTVID.COM | 10 |
| EGA.EXE | 10 |

Appendices

| | |
|---|----|
| A. Troubleshooting/Installation Tips | 14 |
| B. Monitor Configurations | 15 |
| Alternate Default Mode | 16 |
| Two Monitors | 17 |
| C. Connector Pinouts & Sync Frequencies | 20 |
| D. Glossary | 21 |

Hardware/Installation

Introduction

The EGA/CGA Graphics Adapter is the most versatile and full-featured graphics card available in its size. This multi-application video card combines on a single card the text, graphics, and color capabilities of the IBM Enhanced Graphics Adapter®, IBM Monochrome Adapter®, IBM Color/Graphics Adapter®, the Plantronics® COLORPLUS® Adapter, and the Hercules™ Monochrome Graphics Adapter.

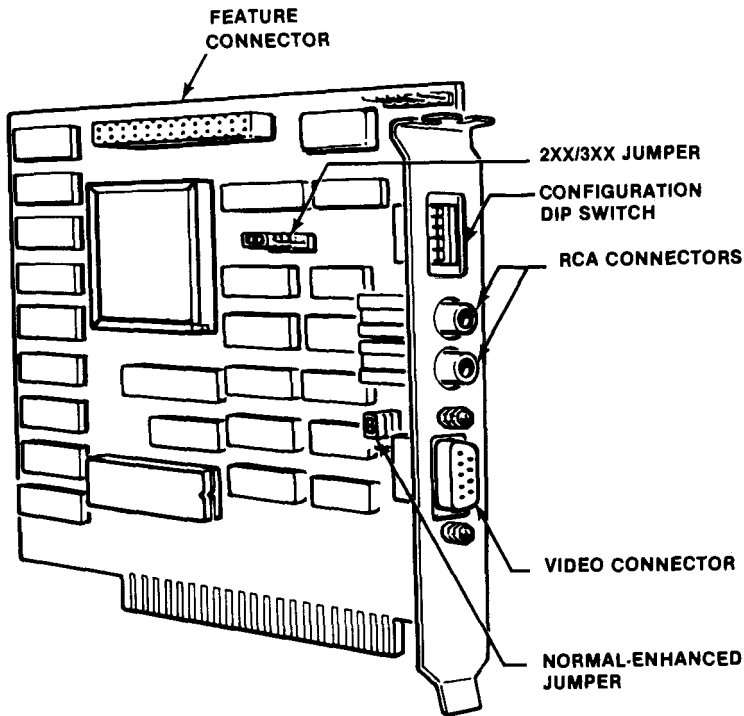
Below is a summary of the various display choices provided by the EGA/CGA card:

- **IBM-compatible Monochrome Text and Hercules-compatible Monochrome Graphics**—The EGA/CGA displays all high-resolution Hercules-compatible graphics and the high-resolution monochrome IBM character set.
- **Color/Graphics**—The EGA/CGA provides the ability to run software written for numerous other video cards, including the IBM EGA card, Hercules Graphics card, IBM CGA card and the Plantronics COLORPLUS card.
- **Plantronics-compatible Color/Graphics**—The EGA/CGA supports all Plantronics-compatible software, displaying either 16 colors at 320 x 200 resolution or four colors at 640 x 200 resolution.
- **16-Color High Resolution**—The EGA/CGA displays 16 colors at up to 640 x 350 resolution.
- **External DIP Switches**—The EGA/CGA allows you to change the DIP switch settings without opening the computer cover.
- **256K of Video Memory**—The EGA/CGA card has 256K of video memory installed as a standard feature. You have no extra chips or "piggy-back" cards to buy.
- **Easy Installation**—The EGA/CGA fits in a short expansion slot.

The EGA/CGA card is designed for use with the VM5, CM5, CM11, and EGM1 Tandy® monitors.

Hardware Components

The EGA/CGA card includes numerous hardware components. The figure and listing below describe the location and function of each component, and should be consulted during the installation procedure should you have any difficulty locating the various components.



Video Connector: A nine-pin socket used to connect the monitor.

RCA and Feature Connectors: The connectors and circuitry are the same as those contained in the IBM EGA card, and are included to ensure compatibility with this card. The connectors are not directly related to the operation of the EGA/CGA card, and the RCA connectors do not provide composite video.

Configuration DIP Switches: A single row of five switches which are turned on or off to set the monitor and video card configuration. Switches 1 through 4 set the monitor/video card combination, and function exactly like those found in the IBM EGA card. Switch 5 sets the default mode of the card as either an EGA card (Switch 5 off) or a non-EGA card (Switch 5 on).

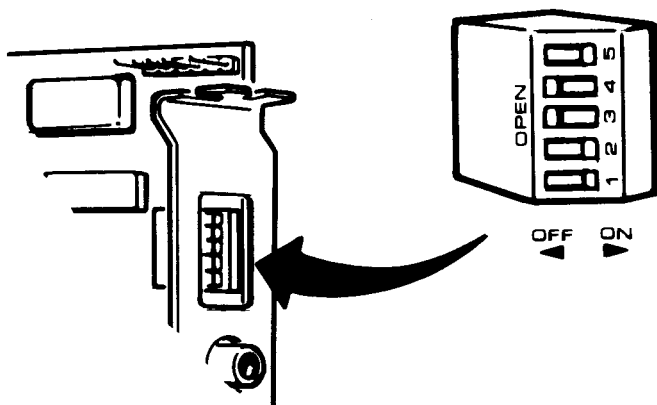
2XX/3XX Jumper: The jumper (like the RCA and feature connectors) is included to maintain compatibility with the IBM EGA card and should remain in the factory setting. The jumper controls the mapping of the I/O ports on the EGA/CGA card, and the card itself will not work if the jumper setting is changed.

Normal/Enhanced Jumper: The jumper is used to configure a monitor for use with the EGA/CGA card. One setting is used for monochrome and standard RGB displays. The other setting is used for enhanced RGB displays.

Selecting a Default Video Mode

The default video mode is the video mode your computer automatically uses when you turn it on. The EGA/CGA lets you select one of three video modes as the default mode for your system - monochrome, standard RGB, and enhanced RGB.

The configuration DIP switches you use to select the EGA/CGA's default video mode are located in the top right corner of the card. (See the following illustration.)



The following tables illustrate the settings for configuring an EGA/CGA card with a single video display adapter. Refer to the appendix entitled "Monitor Configurations" for settings using more than one monitor.

| Monitor Type | Switch 1 | Switch 2 | Switch 3 | Switch 4 |
|--------------------------|----------|----------|----------|----------|
| VM5 (monochrome) | OFF | OFF | ON | OFF |
| CM5, CM11 (standard RGB) | OFF | OFF | OFF | ON |
| EGM1 (Enhanced RGB) | OFF | ON | ON | OFF |

| Default Mode @ Power up | Switch 5 |
|-------------------------|----------|
| EGA Operation | OFF |
| Compatible Operation* | ON |

- * CGA/Plantronics operation if you have an RGB monitor, MDA/Hercules operation if you have a monochrome monitor.

The settings shown in the tables above are generally the most appropriate settings for single monitor installations. These settings provide the best display for the available monitor.

Note that the EGA/CGA card has a Switch 5, an additional DIP switch not found on standard EGA cards. Switch 5 determines the default mode of your system when you turn on the power.

If DIP Switch 5 is set to the OFF position, the system reads the EGA/CGA card as if it were an IBM-compatible EGA card. If the DIP switch is set to ON, the EGA/CGA card reads that a non-EGA mode is compatible with your monitor.

The diskette provided with the EGA/CGA card contains a program called EGA.EXE. This program allows you to override the setting of Switch 5 and switch operation of the card between EGA and the compatibility modes appropriate for your monitor. See the EGA.EXE discussion in the "Utility Diskette" section later in this manual.

Idle Switch Setting

Tandy 1000 SX and TX computers have three unique color graphics modes which are not supported by the EGA/CGA. Some software written for the Tandy 1000 computers use these modes and will not run correctly if the EGA/CGA is the primary display adapter. These programs will only operate properly with the Tandy 1000's built-in display adapter. To use the Tandy 1000's on-board color graphics adapter without removing the EGA/CGA, it is necessary to change the switch setting to make the EGA/CGA default to monochrome mode with a color/graphics adapter (the Tandy 1000's) as the primary display adapter. See Appendix B: Table 4.

| Switch 1 | Switch 2 | Switch 3 | Switch 4 | Switch 5 |
|----------|----------|----------|----------|----------|
| OFF | ON | OFF | ON | OFF |

Be sure your monitor is connected to the Tandy 1000 RGB or composite video output. Disconnect the monitor from the EGA/CGA card if necessary.

When you want to resume use of the EGA/CGA card, simply return the EGA/CGA card switches to their original setting, and reconnect the monitor to the EGA/CGA card if necessary.

Video Card Compatibility Chart

You can use the EGA/CGA card for either color or monochrome applications. If you already own another video card (monochrome, color, or EGA), the EGA/CGA allows several configurations in which you can use your system to run applications that use both color and monochrome monitors.

The following chart lists possible twin video card configurations. The first column is the default mode of the EGA/CGA, the second column lists compatible cards for each default video mode, and the third lists cards that will conflict.

| EGA/CGA set as: | Co-exists with: | Conflicts with: |
|----------------------------|---|---|
| EGA (monochrome monitor) | IBM-compatible CGA Plantronics adapter | IBM-compatible MDA Hercules graphics |
| EGA (standard RGB monitor) | IBM-compatible MDA Hercules graphics | IBM-compatible CGA Plantronics adapter |
| EGA (enhanced RGB monitor) | IBM-compatible MDA Hercules graphics | IBM-compatible CGA Plantronics adapter |
| CGA/Plantronics | nothing | everything |
| MDA/Hercules | nothing | everything |

Monitor/Mode Compatibility Chart

The following chart illustrates the various text and graphics modes available with different Tandy monitors:

| Mode: | EGM-1 | CM-11 | CM-5 | VM-5 |
|---|-------|-------|------|------|
| color: | | | | |
| 40 column text | yes | yes | yes | no |
| 80 column text | yes | yes | yes | no |
| 320 x 200 4 color CGA graphics | yes | yes | yes | no |
| 640 x 200 B&W CGA graphics | yes | yes | no | no |
| 320 x 200 16 color Plantronics graphics | yes | yes | yes | no |
| 640 x 200 4 color Plantronics graphics | yes | yes | no | no |
| 320 x 200 up to 16 color EGA graphics | yes | yes | yes | no |
| 640 x 200 up to 16 color EGA graphics | yes | yes | no | no |
| 320 x 350 up to 16 color EGA graphics | yes | no | no | no |
| 640 x 350 up to 16 color EGA graphics | yes | no | no | no |
| monochrome: | | | | |
| 80 column text | no | no | no | yes |
| 720 x 348 graphics | no | no | no | yes |
| 640 x 350 graphics | no | no | no | yes |

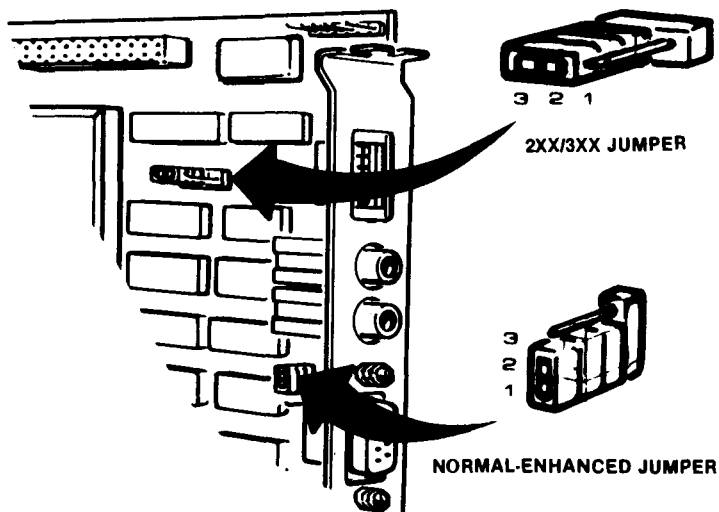
Computer Settings

Be sure to adjust your computer to the correct settings for use with the EGA/CGA card. If you have the Tandy 1200, set the switches to the EGA setting. Consult your hardware documentation. If you have the Tandy 3000 or 4000, run the SETUP program. No adjustment is needed for the Tandy 1000 because the EGA setting is automatic.

Note to Tandy 3000 and 4000 users: Whenever you change default video display modes, be sure to run SETUP.

Jumper Settings

To set the Normal/Enhanced jumpers on the EGA/CGA, refer to the following figure.



Set the Normal/Enhanced jumper as appropriate for your monitor. Place the jumper over the two upper pins if you have a monochrome or standard RGB monitor. Place the jumper over the two lower pins if you have an enhanced RGB monitor.

The 2XX/3XX jumper is set at the factory. This jumper controls the mapping of the I/O ports on the EGA/CGA card and cannot be changed without causing the card to malfunction.

Installation Procedure

You can install the EGA/CGA card in any Tandy 1000 TX or SX, Tandy 1200, Tandy 3000 or Tandy 4000 slot. Consult your hardware documentation. Then, follow all these instructions carefully.

Before proceeding, be sure the EGA/CGA card and your computer are fully configured.

1. Turn off all equipment. Remove the computer cover.
2. Select an empty expansion slot. If necessary, remove a system expansion slot cover by unscrewing and removing a retaining screw. Save the screw.
3. Hold the EGA/CGA card by its top corners and slide it into the system unit. Be sure that the card is fully seated in the expansion slot.
4. Secure the EGA/CGA card with the retaining screw you removed in Step 2. Replace the computer cover.

Screen Resolution

Remember that the best looking video display is generally obtained by installing the application software with the highest resolution mode available on your monitor.

If you have a monochrome monitor, experiment with both EGA and Hercules installations. Hercules provides better resolution while the EGA provides more shading options.

Some applications automatically detect the video and monitor installed for your system. These programs will automatically configure your system to the highest resolution mode available. Remember to use EGA mode when you run one of these programs.

Utility Diskette

The diskette included with your EGA/CGA card contains two programs that are designed to maximize the use of the card. The EGA.EXE program allows you to manually select the operational mode of the EGA/CGA card either from a menu or directly from the DOS prompt. The INTVID.COM program reconfigures the Tandy 1000 computers for compatibility with the Hercules graphics full mode.

INTVID.COM

Use the INTVID.COM program when the EGA/CGA card is installed in a Tandy 1000 computer using a monochrome monitor and operating in Hercules full mode (see EGA HERC1). Because the color adapter circuitry of the Tandy 1000 computers conflicts with the Hercules full mode, the INTVID.COM program reconfigures the system for full compatibility.

To turn off the Tandy 1000 video circuit, turn on your computer system. At the DOS prompt, insert the diskette in Drive A, and type:

```
INTVID OFF
```

This allows the color adapter circuitry to turn off so that Hercules full mode can be used.

To restart the Tandy 1000 video circuit after turning your computer off, at the DOS prompt, insert the diskette in Drive A, and type:

```
INTVID ON
```

This turns on the color adapter circuitry so that it can be used in a two monitor system with the EGA/CGA card.

EGA.EXE

DIP Switch 5 sets the default mode of operation when you start up the computer. Implementing the EGA.EXE program overrides the Switch 5 setting, allowing the mode to switch back and forth between EGA and a compatibility mode such as Hercules, as appropriate for the monitor in use.

EGA.EXE also lets you start a game disk that otherwise might not run on the EGA/CGA card (or other EGA cards) because of exotic copy protection schemes.

To start the EGA.EXE program, turn on your computer system. At the DOS prompt, insert the diskette in Drive A, and type:

A:EGA

A menu will appear listing the EGA/CGA options. Depending on the configurations of your monitor and system, options available for your system will be highlighted. Options not available will be appear as normal text. Use the up and down arrows to select an option; then press to execute your selection.

EGA.EXE can also be run from the DOS prompt line, bypassing the menu. This is useful for incorporating EGA.EXE commands into a batch file. Following is a listing and explanation of the various EGA.EXE parameters which can be typed from the DOS prompt:

EGA

Boots the EGA menu.

EGA EGA

Switches to EGA operation from compatible mode.

EGA CGA

(For use with color displays.) Turns off EGA mode. Switches to **CGA mode**. If you are using an enhanced color display in 350 line mode, the card will switch to 200 line mode as if you had an actual CGA card. A warm boot (Control-Alt-Del key sequence) will bring you back to the default mode specified by DIP Switch 5.

EGA PLANT

(For use with color displays.) Turns off EGA mode. Switches to **Plantronics mode**. If you are using an enhanced color display in 350 line mode, the card will switch to 200 line mode as if you had an actual Plantronics card. A warm boot (Control-Alt-Del key sequence) will bring you back to the default mode specified by DIP Switch 5.

EGA MDA

(For use with monochrome displays.) Turns off EGA mode. Switches to **Monochrome text mode**. A warm boot (Control-Alt-Del key sequence) will bring you back to the default mode specified by the DIP Switch 5.

EGA HERCO

(For use with monochrome displays.) Turns off EGA mode. Switches to **Hercules half mode** (equivalent to using the Hercules HGC Half command). A warm boot (Control-Alt-Del key sequence) will bring you back to the default mode specified by DIP Switch 5.

EGA HERC1

(For use with monochrome displays.) Turns off EGA mode. Switches to **Hercules full mode**. (Equivalent to using the Hercules HGC Full command). A warm boot (Control-Alt-Del key sequence) will bring you back to the default mode specified by DIP Switch 5.

EGA B00T

Prompts the user to insert a disk in Drive A and press a key to boot a disk. Used in conjunction with specific video mode parameters to run protected game program.

If you make a mistake typing the EGA command, the program gives you the option of using the EGA menu or returning to DOS.

Also, more than one EGA command line can be used. The example below sets the EGA/CGA card to start a protected CGA game disk.

EGA CGA B00T

Appendices

A. Troubleshooting/Installation Tips

Symptom

Solution

One long beep and two short beeps when starting the computer.

The EGA/CGA card is not properly seated in expansion slot or expansion slot connector is dirty. Reseat or clean the "gold fingers" which attach to the motherboard. A pencil eraser works well.

Tandy 1200/PC users: Switches 5 and 6 of SW 1 not correctly set for the EGA/CGA card as it is configured. Be sure that both switches 5 and 6 are in the ON position.

No display or distorted display.

System and/or EGA/CGA card not configured appropriately for the monitor type in use. Review "Installation Procedure."

Monitor and/or power cable not properly plugged in.

Monitor not turned on, or the brightness and contrast controls not turned up far enough.

F1 CRT startup error.

SETUP program not run. See "Computer Settings" and the instructions supplied with your computer.

B. Monitor Configurations

The DIP switch settings discussed in "Selecting a Default Video Mode" represent the standard configuration and are designed for most users of single monitor systems. The standard configuration cannot be used in the following situations:

- The default mode is other than the one selected by the standard switch settings. See "Alternate Default Mode."
- The system contains two monitors and both the EGA/CGA card and a second video card. See "Two Monitors."

These situations require configurations different than the standard design. Read the following discussion for these non-standard configurations.

Alternate Default Mode

Perform each of the following steps to configure the EGA/CGA card for a default mode other than that selected with the standard switch settings:

- Follow the diagram in "Selecting a Default Video Mode" to locate the DIP switch on the EGA/CGA card.
- Set DIP Switch 5 to determine the default operating mode upon starting the system. EGA is the default when Switch 5 is off. Setting Switch 5 on chooses a compatible mode appropriate for your monitor as the default mode when the computer is started.
- Switches 1 through 4 describe the monitor and should be set as follows:

| Monitor: | Lever1 | Lever2 | Lever3 | Lever4 |
|---|--------|--------|--------|--------|
| Monochrome | OFF | OFF | ON | OFF |
| Standard RGB (40 column mode is default) | ON | OFF | OFF | ON |
| Standard RGB (80 column mode is default) | OFF | OFF | OFF | ON |
| Enhanced RGB (200 Line or emulation of standard RGB is default) | ON | ON | ON | OFF |
| Enhanced RGB (350 line, true enhanced operation is default) | OFF | ON | ON | OFF |

Two Monitors

The EGA/CGA card will support a two-monitor system only when the second video card is an IBM Monochrome Display Adapter (MDA), IBM Color/Graphics Display Adapter (CGA), or an equivalent of either adapter. One of the two monitors must be selected as the primary display, and this information, along with the type of video card, is set in the EGA/CGA card DIP Switches 1 through 4. If at any time you want to change the primary display monitor, you must reconfigure the EGA/CGA card.

A two monitor system requires that the EGA/CGA card must be used in the EGA mode. Select the mode which represents the appropriate adapters and primary display. Note that each monitor requires a separate video card, thus a two monitor system necessitates two video cards. You are also limited to the normal limit of one RGB or composite display and one monochrome display attached to the computer. The Compatible Mode Selection is OFF for the two monitor settings.

| Lever1 | Lever2 | Lever3 | Lever4 | Lever5 | Primary mode/monitor |
|--------|--------|--------|--------|--------|---------------------------|
| ON | OFF | OFF | ON | OFF | 40 column on standard RGB |
| OFF | OFF | OFF | ON | OFF | 80 column on standard RGB |
| ON | ON | ON | OFF | OFF | 200 lines on enhanced RGB |
| OFF | ON | ON | OFF | OFF | 350 lines on enhanced RGB |

Table 1
Primary Display: EGA/CGA card
Additional Display: IBM monochrome display
adapter or equivalent

An RGB monitor must be connected to the EGA/CGA card. Connection of a monochrome monitor to the monochrome display is optional, but only a monochrome monitor can be connected to this display.

| Lever1 | Lever2 | Lever3 | Lever4 | Lever5 | Primary mode/monitor |
|--------|--------|--------|--------|--------|---------------------------|
| ON | ON | ON | ON | OFF | 40 column on standard RGB |
| OFF | ON | ON | ON | OFF | 80 column on standard RGB |
| ON | OFF | ON | ON | OFF | 200 lines on enhanced RGB |
| OFF | OFF | ON | ON | OFF | 350 lines on enhanced RGB |

Table 2
Primary Display: IBM monochrome display
adapter or equivalent
Additional Display: EGA/CGA card

A monochrome monitor must be connected to the monochrome display. An RGB monitor may be connected to the EGA/CGA card.

| Lever1 | Lever2 | Lever3 | Lever4 | Lever5 | Primary mode/monitor |
|--------|--------|--------|--------|--------|-----------------------|
| ON | OFF | ON | OFF | OFF | 40 column on RGB/Comp |
| OFF | OFF | ON | OFF | OFF | 80 column on RGB/Comp |

Table 3
Primary Display: EGA/CGA card
Additional Display: IBM color/graphics display adapter
and equivalents

A monochrome monitor must be connected to the EGA/CGA card. An RGB or composite monitor may be connected to the color/graphics display adapter, but only an RGB or composite monitor may be connected to this display.

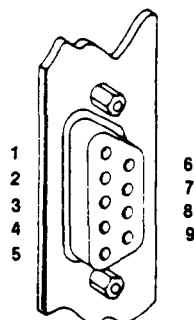
| Lever1 | Lever2 | Lever3 | Lever4 | Lever5 | Primary mode/monitor |
|--------|--------|--------|--------|--------|-----------------------|
| ON | ON | OFF | ON | OFF | 40 column on RGB/Comp |
| OFF | ON | OFF | ON | OFF | 80 column on RGB/Comp |

Table 4
Primary Display: IBM color/graphics display adapter
and equivalents
Additional Display: EGA/CGA card

An RGB or composite monitor must be connected to the color/graphics display adapter, but only an RGB or composite monitor may be connected to this display. A monochrome monitor may be connected to the EGA/CGA card.

Note: After you complete the EGA/CGA configuration, always set system board switches or run the SETUP program as if you were installing an EGA/CGA card. This must be completed regardless of your display or adapter configuration.

C. Connector Pinouts & Sync Frequencies

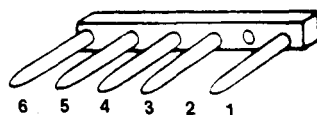


Video port connector pinout by monitor:

| PIN | Monochrome | RGB | Enh RGB |
|-----|------------|-----------|----------|
| 1 | Ground | Ground | Ground |
| 2 | Ground | Ground | S. Red |
| 3 | N/A | Red | Red |
| 4 | N/A | Green | Green |
| 5 | N/A | Blue | Blue |
| 6 | Intensity | Intensity | S. Green |
| 7 | Video | N/A | S. Blue |
| 8 | H. Sync | H. Sync | H. Sync |
| 9 | V. Sync | V. Sync | V. Sync |

1 LIGHT PEN INPUT (+)
2
3 LIGHT PEN SWITCH (+)

4 GROUND
5 + 5 VOLTS
6 + 12 VOLTS



Sync frequencies by monitor type:

| Mode | Vertical | Horizontal |
|---------------------|----------|------------|
| EGA Monochrome | 49.4 Hz | 18.2 KHz |
| MDA Monochrome | 50.0 Hz | 18.43 KHz |
| Hercules Monochrome | 50.9 Hz | 18.8 KHz |
| Standard RGB | 60.0 Hz | 15.7 KHz |
| Enhanced RGB | 60.0 Hz | 15.7 KHz* |
| Enhanced RGB | 60.0 Hz | 21.8 KHz** |

* 200 line mode

** 350 line mode

D. Glossary

Several acronyms are used throughout the manual to reduce the necessity of repeatedly listing long product names or types. The following is a list of acronyms appearing in the manual:

BIOS or ROM BIOS: The acronym for Basic Input-Output System. These are the programs that are permanently stored in your computer system in ROM (Read Only Memory) providing the power-on self test and the ability to recognize and use the EGA/CGA card in your system.

CGA: The IBM Color/Graphics Adapter.

default mode: The mode of operation is the set of capabilities and the resolutions currently available and the current display mode (monochrome, RGB, etc). The default mode refers to the mode in which the EGA/CGA card automatically operates after system power-up.

EGA: The IBM Enhanced Graphics Adapter.

Enhanced RGB or color display: The monitor type similar in operation to the RGB display; when driven by the IBM EGA or the EGA/CGA card the display is capable of resolutions up to 640 dots horizontal by 350 lines vertical in up to 16 colors from a palette of 64 colors. The IBM Enhanced Color Display is an example of this display. The EGM1 monitor is an example of this display.

monochrome display: The monitor type compatible with the IBM Monochrome Display Adapter (MDA), the IBM Enhanced Graphics Adapter (EGA), the Hercules Graphics Card, and the EGA/CGA card. It displays all information in a single, monochromatic color. It is sometimes called a TTL monitor or display, referring to the type of signal that the display accepts. Maximum resolution using this display with the EGA/CGA card is 720 dots horizontal by 348 lines vertical when using the IBM MDA and Hercules compatible software. The resolution is 640 dots horizontal by 350 lines vertical when used with EGA/CGA compatible software. The VM5 monitor is an example of this display.

monitor or display types: The EGA/CGA card supports three types of monitors or displays: monochrome, RGB and enhanced RGB.

Plantronics: The EGA/CGA card in the Plantronics mode resembles a Plantronics COLORPLUS adapter. This mode provides compatibility with the IBM Color/Graphics Adapter (CGA) plus two extended color modes that are supported by programs such as Lotus Symphony. The extended modes provide resolutions of 320 X 200 dots with a palette of 16 colors, or 640 X 200 dots with a palette of 4 colors.

primary display: The display in a two display system which is active when you start the computer.

RGB or color display: The monitor type compatible with the IBM Color Graphics Adapter (CGA), the IBM Enhanced Graphics Adapter (EGA) and the EGA/CGA card. The letters R, G, and B refer to both the arrangement of electrical signals necessary to drive this device and to the primary colors (red, green and blue) from which all 16 of the display's colors derive. The display is capable of resolutions of up to 640 dots horizontal by 200 lines vertical in up to 16 colors when driven by the CGA or EGA/CGA card. The CM5 and CM11 monitors are examples of this display.

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