

Multitech Industrial Corp.
MultiGraphics Card

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FCC Notice

Warning: This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with manufacturer's instructions, may cause interference with 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 Subpart 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:

- * Reorient the receiving antenna.
- * Relocate the computer with respect to the receiver.
- * Move the computer away from the receiver.
- * Plug the computer into a different outlet so that the two devices 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.

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The MultiGraphics Card

The MultiGraphics Card is an advanced video display adapter for the IBM PC, XT, AT and compatible computers. The MultiGraphics Card provides support that goes beyond that supplied by either the IBM monochrome display adapter or the IBM color/graphics adapter for all monitors normally served by these cards. The MultiGraphics Card supports the IBM monochrome (or equivalent) display in a 720H by 350V Hercules compatible graphics mode as well as the normal 720H by 350V text mode of the IBM monochrome display adapter. The MultiGraphics Card supports RGB monitors in two extended color (Plantronics COLORPLUS compatible) modes in addition to the standard modes supported by the IBM color/graphics adapter.

Mode and resolution	Compatible Monitor(s)	
	IBM Monochrome	RGB
IBM CGA Text 80 Column(B&W)		●
IBM CGA Text 40 Column(B&W)		●
IBM CGA Text 80 Column(color)		●
IBM CGA Text 40 Column(color)		●
IBM CGA 320x200x4 color graphics		●
IBM CGA 640X200X2 color graphics		●
Plantronics COLORPLUS compatible 320x200x16 color graphics		●
Plantronics COLORPLUS compatible 640x200x4 color graphics		●
IBM Monochrome display adapter 80 column text	●	
Hercules compatible graphics(720Hx350V)		●

The MultiGraphics Card User's Guide

The sections that follow describe in detail the setup and installation of the MultiGraphics Card. Each section includes step-by-step instructions. Topics of special interest are found in the Appendices of this manual.

Information that is specific to a group of users such as **IBM AT USERS** is identified with bold lettering at the beginning of the applicable paragraph(s). Some of the illustrations in this manual may be repeated several times. This is done intentionally for your convenience while installing your MultiGraphics Card.

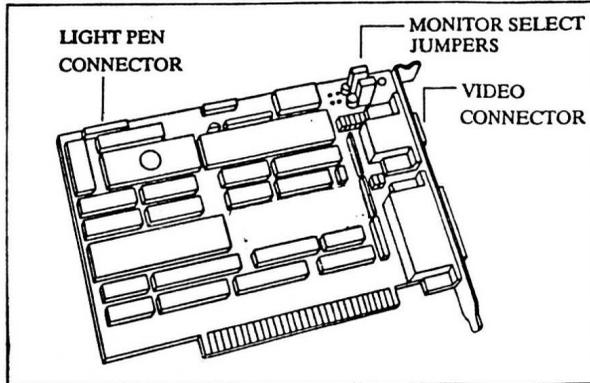
BEFORE YOU START: Take a look at the table of contents of this manual. It will give you an idea of the steps necessary to install the MultiGraphics Card. Special topics are covered in the Appendices of this manual. Read through the list and see if any of these topics apply to your installation.

Layout of the MultiGraphics Card

The figure below shows the features and controls of the MultiGraphics Card. Study it and make sure that you can identify the following items. They will be referenced throughout this manual.

- The Light Pen Connector.
- The Video Connector.
- The Monitor Select Jumpers.

MultiGraphics Card



Compatibility of the MultiGraphics Card

The MultiGraphics Card can be used with any of the following monitors: IBM (or equivalent monochrome displays) or RGB displays.

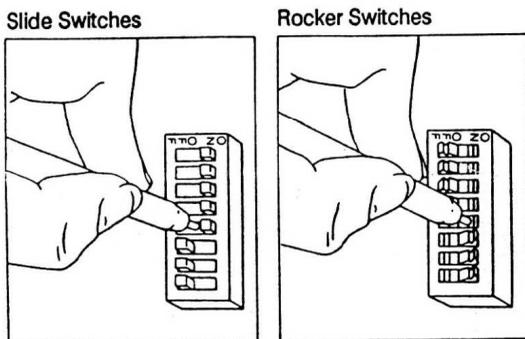
The MultiGraphics Card is compatible with the IBM PC/XT/AT family of computers as well as most IBM PC compatible computers.

Tools you will need to install the MultiGraphics Card

To install the MultiGraphics Card, you will need a medium size flat blade screwdriver and a 3/16" nut driver or wrench.

How to set DIP switches

This manual will make frequent reference to switches with rows of levers called DIP switches. These switches are found on the MultiGraphics Card and the system boards of the various computer systems in which the MultiGraphics Card may be installed. These switches come in two styles: slide switches and rocker switches. Refer to the figure below for a detailed view of how to set these switches. The ball-point pen in each illustration is turning a lever to the ON position. *Remember that OPEN means OFF.*



Setting the MultiGraphics Card controls

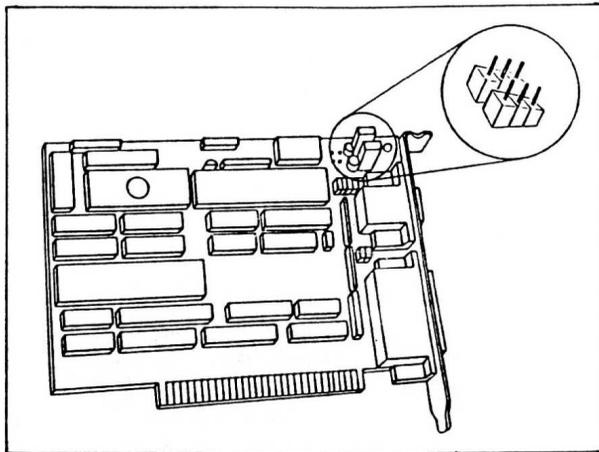
Refer to the illustration below and find the Jumpers on the MultiGraphics Card. They must be set according to the type of monitor to be used with the MGC.

The Jumpers configure the MGC to appear as one of the following display adapters:

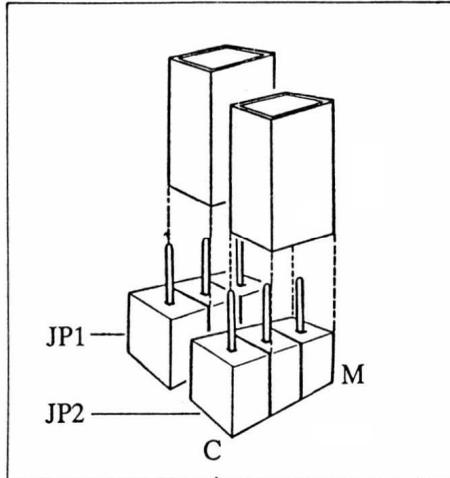
An IBM monochrome display adapter/Hercules compatible display adapter.

An IBM color and graphics/Plantronics COLORPLUS compatible display adapter.

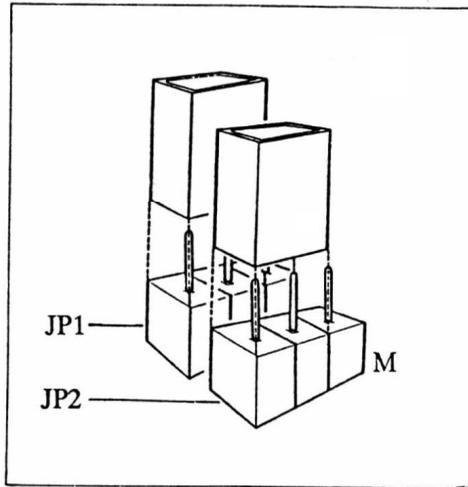
Jumpers



MONOCHROME DISPLAY USERS: Set the Monitor Select Jumpers to the MONO position. This tells the MGC that it will be connected to an IBM monochrome or equivalent display and that the MGC is to appear as an IBM monochrome/Hercules compatible display adapter.



RGB DISPLAY USERS: Set the Monitor Select Jumpers to the COLOR position as illustrated below. This tells the MGC that it will be connected to an IBM RGB or equivalent monitor. The MultiGraphics Card will appear to the computer system as a color and graphics/Plantronics COLORPLUS compatible display adapter.



Preparing your computer for the MultiGraphics Card

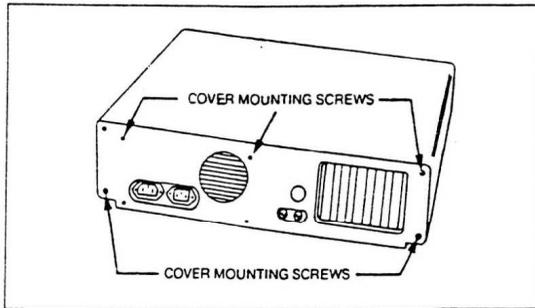
Several steps must be performed before you install your MultiGraphics Card in your computer system. This section outlines the switch setting procedures required prior to actual physical installation of the MultiGraphics Card in your computer system.

The illustrations that follow are specific to the IBM PC, XT and AT computers, but most PC compatible computers are similar in design. If you are installing the MultiGraphics Card in a non-IBM system please consult your system user's guide for specifics.

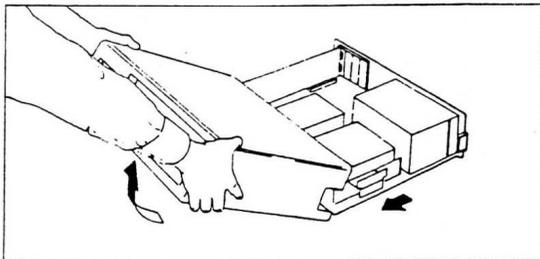
Open up your computer system

Before you open your system, be sure that you have turned off your system unit and all devices connected to it. It is also a good idea to disconnect all cables from the back of the system. This will give you more room to work.

- + The figure below illustrates the locations of the cover mounting screws on an IBM PC computer. Older units have only 2 cover mounting screws; newer PC, XT and AT units have 5. All cover mounting screws are located on the back of the computer. Remove these screws.



- + Carefully slide the system unit cover forward. When the cover will not go any further, tilt it up as shown below and lift it away.



In the IBM PC, XT and most compatible computers, levers 5 and 6 of switch 1 on the system board control the functions that affect the operation of the MultiGraphics Card. Refer to the figure above for the location of switches 1 and 2. Switch 2 does not appear on the XT system board.

ALL USERS: Before you change any switch settings in your computer, please jot down the current settings. If you run into any difficulties, you will then be able to restore your system to its previous operational status.

Levers 5 and 6 of Switch 1 tell the system what video adapter card to expect (monochrome or color/graphics). Depending on the mode of operation selected, the MultiGraphics Card should be treated as a color/graphics adapter or as a monochrome display adapter. Refer to the table below and find the system description that describes your installation and set levers 5 and 6 of Switch 1 as is appropriate.

WARNING: *The settings below are appropriate when the MGC is the only video card in the system. If you are using more than one video card and monitor, please refer to Appendix B of this manual.*

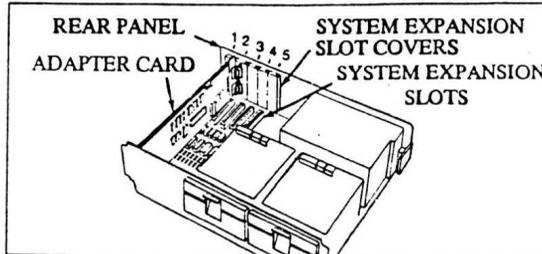
Monitor to be used with the MGC:	SW1 lever 5	SW1 lever 6
-------------------------------------	-------------	-------------

Monochrome Display	OFF	OFF
RGB Display	ON	Off

WARNING: *It is extremely important that these controls are properly set for the monitor you are using. Improper settings can result in damage to your monitor.*

Your system is now ready to receive the MultiGraphics Card.

Installing the MultiGraphics Card in your system



IS THE POWER OFF?

- + Refer to the figure above. If necessary, remove a system expansion slot cover by removing its retaining screw and lifting it out. Save the screw.
- + Hold the MultiGraphics Card by its top corners and slide it into the system unit. Make sure that the MultiGraphics Card is fully seated in the expansion slot .
- + Secure the MultiGraphics Card with the screw that you removed in the step above.

Before you close up your system, check your work

- + Did you properly set the switches on the MultiGraphics Card?
- + Did you properly set your computer's system switches?
- + Replace and secure the system cover.

- + Plug your monochrome or RGB monitor into the 9-pin connector at the rear of the MultiGraphics Card.

IBM AT USERS: Start your system with the diagnostic diskette supplied with your system and run the setup program.

Your MultiGraphics Card installation is now complete. If you have any problems, please refer to the troubleshooting guide later in this manual for assistance. If you still have problems, consult the dealer from which you purchased your MultiGraphics Card.

Operation of the MultiGraphics Card

The setting of the Monitor Select Switch on the MultiGraphics Card determines what type of monitor will be supported by the card. If you have followed this manual so far, you are now ready to use your MultiGraphics Card.

Monochrome Operation

When you turn on your computer, the MultiGraphics Card will look to your computer system as if it were an IBM monochrome display adapter. In this mode of operation, the MultiGraphics Card supports IBM monochrome and equivalent displays in an 80 column text mode. No special software is needed to use this mode.

Many popular software packages support monochrome graphics on the MultiGraphics Card in a Hercules compatible mode. Most of these programs already "know" how to use this mode and require no special software to activate the Hercules compatible mode on the MultiGraphics Card.

MGC.COM: Some of the software packages that utilize the Hercules compatible monochrome graphics capability of the MultiGraphics Card require that you first explicitly put the MultiGraphics Card in graphics mode. This is accomplished by using the supplied program MGC.COM. The following table summarizes the use of MGC.COM and assumes that a copy of MGC.COM resides on the default (active) disk drive of your computer system.

What you type:	Resulting mode of operation
MGC FULL (RETURN)	Full graphics mode enabled. This mode is suitable for use with Lotus 1-2-3 (version 1A) and other packages that utilize the Hercules compatible mode of the MGC.
MGC HALF (RETURN)	Enables page 0 of the Hercules graphics capability of the MGC and allows the MGC to co-exist in a computer system with another video card. Please see APPENDIX B of this manual for details.
MGC IBM (RETURN)	Returns the MGC to IBM text mode, suitable for use with text applications that require the IBM monochrome display adapter. This is the default mode of the card when you power up your system.
MGC SAVE (RETURN)	The SAVE option turns off the monochrome screen after several minutes of operation. This will add extra life to the phosphors of the monochrome display screen as well as keeping your data from the eyes of casual observers when you are away from your system. Warning: There are several similar "save" programs available in the public domain. Do not use them with the MGC. Monitor damage may result!

The options within MGC.COM may be invoked by themselves or in combination with each other. For example, you could invoke the FULL graphics mode and the SAVE option by typing:

MGC FULL SAVE (RETURN)

NOTE: *The SAVE option installs memory resident code that may not be compatible with all software products on the market. They are provided for your convenience only. Please discontinue use of these options if their operation interferes with your application programs or causes distortions on the screen when used in conjunction with other programs.*

NOSAVE disables the SAVE option. Typing MGC (RETURN) by itself will give you a menu of options to choose from. Follow the directions on the screen.

LOTUS 1-2-3 USERS: Lotus 1-2-3 can take advantage of the MGC's Hercules compatible graphics. Version 1A of Lotus 1-2-3 requires that you use MGC.COM to put the MGC in "FULL" mode before execution. If you have version 1A of Lotus 1-2-3, refer to Appendix D of this manual for details. 2.0 and later versions of Lotus 1-2-3 do not specifically require the use of MGC.COM. All versions, however, require that you install Lotus 1-2-3 drivers for operation with a Hercules card. Please refer to the Lotus 1-2-3 documentation for details.

SOFTWARE INSTALLATION TIP: Like Lotus 1-2-3, most software that can take advantage of the MGC's Hercules compatible mode will generally do so only after it has been properly installed. Please be sure to check the manual(s) that accompany your software for compatibility and installation details. If the instructions for these packages specify that you use the Hercules supplied program HGC.COM to initialize the graphics mode on the Hercules card, simply substitute the equivalent command for MGC.COM.

For example: When instructed to type "HGC FULL" type "MGC FULL".

Color/Graphics Operation

When the MGC is set for "COLOR" operation it appears to both your computer system and your application software as if it were a Plantronics COLORPLUS card. In this mode the MGC provides 320H by 200V by 16 color and 640H by 200V by 4 color graphics modes in addition to the standard text and graphics modes provided by the IBM color/graphics adapter. In other words, the IBM color/graphics capability is a subset of Plantronics COLORPLUS compatibility.

LOTUS 1-2-3 (VERSION 2.0), LOTUS AND SYMPHONY USERS: These and other popular applications can take advantage of the MGC's Plantronics COLORPLUS compatible graphics mode. For specific installation and operating instructions, please refer to the documentation that accompanies these packages.

Many other popular software packages support graphics on the MultiGraphics Card in the Plantronics COLORPLUS compatible mode.

Troubleshooting your MultiGraphics Card installation

Here are some typical symptoms and solutions to installation problems:

Symptom	Solution
One long beep & two short beeps on power up of system.	Levers 5 and 6 of SW1 not correctly set for the MultiGraphics Card as it is configured. If the MGC is set for monochrome, it appears as a monochrome card. Hence, the system must be set to expect a monochrome card(5 and 6 OFF).
Same as above.	MultiGraphics Card not properly seated in expansion slot or expansion slot dirty. Reseat or clean "gold fingers". A pencil eraser works well.
No display on monochrome or RGB monitor.	System and/or MultiGraphics Card not configured appropriately for the monitor type in use. If an RGB display is in use, both the system (levers 5 and 6 of S1 set 5 ON and 6 OFF) and the MultiGraphics Card (switch set for color) must agree and match the monitor type.

Same as above.

Monitor signal and/or power cable not plugged in. Monitor not turned on. Brightness and/or contrast controls not turned up far enough.

Large type (40 column) on RGB monitor when small type (80 column) is desired or vice versa.

Reverse the settings of levers 5 & 6 of SW1 of the computer's mainboard. Example: 5 ON and 6 OFF yields 80 column display, reversing (6 ON, 5 OFF) yields 40 column display.

F1 CRT error in an IBM AT computer on startup.

Switch S1 on the motherboard not correctly set and/or SETUP program not run. See installation instructions supplied with your computer.

Appendix A: Technical specifications for the MultiGraphics Card

Description: The Multitech MultiGraphics Card (MGC) provides support for all of the monitors commonly used with IBM PC and compatible computer systems. The IBM Monochrome (or equivalent display) is supported in both standard 80 column text and in Hercules compatible graphics modes. The IBM RGB monitor and its look-alikes are supported in all of the standard IBM color/graphics modes and in Plantronics COLORPLUS compatible extended color graphics modes.

The MultiGraphics Card is 100% compatible with the IBM color/graphics adapter, the IBM monochrome adapter, the Hercules Graphics Card and the Plantronics COLORPLUS card both in terms of memory/port addressing and software compatibility.

Controls: The Jumpers select operation as either an IBM monochrome/Hercules adapter or an IBM color/graphics/Plantronics COLORPLUS compatible, extended color/graphics adapter. The MGC is compatible with IBM PC/XT/AT and compatible computers.

Monitor Com-
patibility &
Resolutions:

IBM monochrome/Hercules compatible mode supports IBM monochrome or equivalent displays. IBM color/graphics/Plantronics compatible mode supports RGB displays normally associated with the IBM color/graphics adapters. Refer to the table below for specifics:

Mode and resolution	Compatible Monitor(s)	
	IBM Monochrome	RGB
IBM CGA Text 80 Column(B&W)		●
IBM CGA Text 40 Column(B&W)		●
IBM CGA Text 80 Column(color)		●
IBM CGA Text 40 Column(color)		●
IBM CGA 320x200x4 color graphics		●
IBM CGA 640X200X2 color graphics		●
Plantronics COLORPLUS compatible 320x200x16 color graphics		●
Plantronics COLORPLUS compatible 640x200x4 color graphics		●
IBM Monochrome display adapter 80 column text	●	
Hercules compatible graphics(720Hx350V)	●	

**Resolutions &
sync fre-
quencies:**

In monochrome mode, the MGC provides a text resolution of 720H by 350V and a character box of 9 by 14 pixels yielding 25 lines of 80 columns. Hercules graphics mode provides dot-addressable resolutions of 720H by 350V. The above modes are suitable for use with the IBM monochrome or similar display.

In the IBM color/graphics mode, the MGC provides text resolutions of 320H by 200V or 640H by 200V and a character box of 8 by 8 pixels yielding 25 lines of 40 or 80 columns, respectively. Graphics modes of 320H by 200V by 4 colors and 640H by 200V by 2 colors are provided. These modes are identical to those of the IBM color/graphics adapter and are suitable for use with the IBM RGB color or similar monitors.

Plantronics color/graphics modes provide additional modes of 320H by 200V by 16 colors and 640H by 200V by 4 colors.

The MGC provides sync frequencies of 50Hz vertical and 18KHz horizontal for monochrome (TTL) displays, a vertical sync of 60Hz and a horizontal sync of 15.6KHz for RGB displays.

Slot Usage:	1 short or standard expansion slot.
Connectors:	9-Pin connector for RGB or monochrome displays. Berg strips for light pen.
Addressing:	Appears as 4KB of video memory at B000 (Hex) in IBM monochrome text operation, 32KB or 64KB of video memory at B000 (Hex) in Hercules modes, 32KB of video memory at B800 (Hex) for color/graphics mode.
Other features:	Flicker free scrolling, extensive use of LSI technology for high reliability and cool operation. One year warranty.

Appendix B: Using the MultiGraphics Card in a two monitor system

The MultiGraphics Card may be used in a two monitor system in any mode except "full" Hercules mode. The reasons for this are complex. We have provided this background material to help you understand the limitations of such an installation.

Everything that a computer displays on a video screen is a representation of the contents of a special chunk of memory called (naturally enough) video memory. All memory in a computer system is accessed by the CPU using a system of memory "addresses". No two chunks of memory may occupy the same address. Each type of video card (monochrome, color/graphics, etc.) generally provides its own video memory. The amount of video memory necessary for the operation of a video card depends on several factors, the main ones being resolution (number of dots to be displayed on the screen) and the number of colors or shades to be displayed at one time.

In the IBM PC, XT and AT, 64KB of the address space in the computer is set aside for video cards, 32KB for monochrome display adapters and 32KB for color/graphics display adapters. The various display adapters on the market utilize these reserved sections of the memory map in different ways.

Keep in mind that the memory mapping of the individual cards in this discussion can't be changed easily and that the memory mapping of two cards may not overlap in a single installation. It will become apparent when you look at the chart below which cards can and cannot co-exist together in a particular installation.

	32KB "Mono" section	32KB "Color" section
IBM Monochrome Card	●	
IBM Color/Graphics Card		●
MultiGraphics Card in mono mode	●	
MultiGraphics Card in Hercules half mode	●	
MultiGraphics Card in Hercules full mode	●	●
MultiGraphics Card in color mode		●

Looking at the chart, you can see that a two video card system can include any of the "mono" card configurations as long as you stay away from the Hercules full mode of the MultiGraphics Card. An MGC in this configuration must reside in a system by itself.

Here are the other rules for a two card system:

1. A video card configured for monochrome operation must not be connected to an RGB monitor or vice versa. Watch out, IBM monochrome and RGB displays have the same signal connector.
2. Most PC's require that the system board switches (usually levers 5 and 6 of S1) in a multiple monitor configuration be set so that the monochrome display is the default display.

Failure to follow the above rules will probably damage your monitor!

Once you have started your system, you may switch between monitors using the DOS MODE command for most versions of PC and MS DOS. (See your DOS manual for details of the MODE command.)

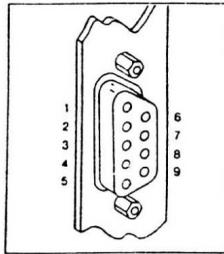
If you are using a software application that can take advantage of two monitors this is the appropriate configuration.

IBM PC and compatible computers do not automatically take advantage of two monitor installations. It is up to the application software package to perform this function.

Appendix C: MultiGraphics Card Connector Pin-outs

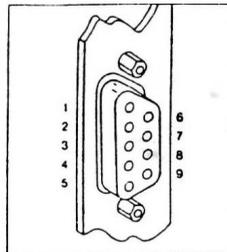
MultiGraphics Card video connector pin-out with switch set for color/graphics or Plantronics operation

Pin#	Function
1	Ground
2	Ground
3	Red
4	Blue
5	Green
6	Intensity
7	Not Used
8	Horizontal Sync
9	Vertical Sync

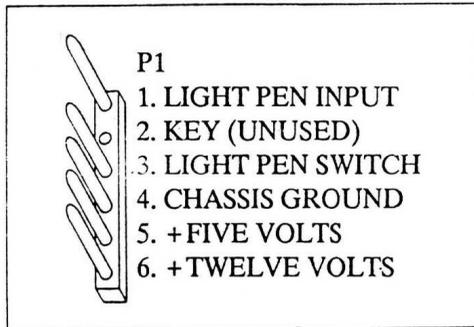


MultiGraphics Card video connector pin-out with switch set for IBM Monochrome/Hercules operation

Pin#	Function
1	Ground
2	Ground
3	Red
4	Blue
5	Green
6	Intensity (+)
7	Video (+)
8	Horizontal Sync (+)
9	Vertical Sync (-)



MultiGraphics Card P1 (Light Pen) connector



Appendix D: Lotus 1-2-3 and the MultiGraphics Card

Lotus 1-2-3 Version 2.0 or later

You may use the MGC with this version of Lotus 1-2-3 in either MONO (Hercules compatible) or COLOR (Plantronics COLORPLUS compatible) modes as appropriate for your monitor type. The only preparation necessary is to install Lotus 1-2-3 for your installation according to the instructions supplied with your Lotus 1-2-3 package.

Lotus 1-2-3 Version 1A

You may use the MGC with this version of Lotus 1-2-3 in either Color (in standard IBM color/graphics modes) or Monochrome (Hercules compatible) modes as appropriate for your monitor type.

For color/graphics operation: (RGB monitors) Follow the installation instructions provided with your Lotus 1-2-3 package. For this installation, you will use the COLOR (RGB monitors) installations for Lotus 1-2-3.

For monochrome (Hercules compatible) operation:

FLOPPY DISK USERS:

1. Follow the instructions provided with your Lotus 1-2-3 package and install 1-2-3 using the HERCULES installation.
2. Modify the AUTOEXEC.BAT file on your 1-2-3 System Disk by placing it in drive A when the "A>" prompt appears on the screen and typing the following: (The word [ENTER] in square brackets means press the enter key.)

COPY CON: AUTOEXEC.BAT [ENTER]

Tells the computer you want to create a new AUTOEXEC.BAT file on the 1-2-3 system disk.

DATE [ENTER]

Tells the computer to prompt you for the date each time you start 1-2-3.

TIME [ENTER]

Tells the computer to prompt you for the time each time you start 1-2-3.

MGC FULL [ENTER]

Tells the computer to put the MGC in FULL Hercules compatible mode each time you start 1-2-3.

LOTUS [ENTER]

Tells the computer to start 1-2-3.

[F6] [ENTER]

Press function key F6 and hit return. This ends the editing process and puts the new AUTOEXEC.BAT on the 1-2-3 system disk.

3. Copy the file MGC.COM to the Lotus 1-2-3 system disk by placing the Multitech supplied diskette in drive B: (if you have only one diskette drive wait until you are prompted to insert a disk for drive B) and type the following:

COPY B: MGC.COM A: [ENTER]

4. Repeat steps 2 and 3 for the 1-2-3 system backup diskette.

HARD DISK USERS: If you have installed your Lotus 1-2-3 on your hard disk follow this procedure.

1. Follow the instructions provided with your Lotus 1-2-3 package and install 1-2-3 using the HERCULES installation.

2. Use the Multitech supplied batch file called SETUP.BAT to create, or modify as necessary, the AUTOEXEC.BAT file on the root directory of your hard disk so that MGC FULL is executed each time that you start your system.

By:

A. Start your computer system as you normally do. When you have the DOS prompt (usually C>). type:

A: [ENTER]

B. Insert the Multitech supplied diskette in drive A and type:

SETUP [hard disk drive letter] [ENTER]

3. When you get the A> prompt back copy MGC.COM to your hard disk by typing:

COPY MGC.COM [hard disk drive letter]
[ENTER]