GSX-86™
Graphics Extension
User’s Guide
for the
IBM® Personal Computer
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******************************************************************************
* First Edition:  July 1983  *
******************************************************************************
## ABOUT THIS BOOK

This guide explains the features and operating procedures of GSX-86™, the Graphics System Extension for the CP/M-86® operating system family. The CP/M-86 family includes two operating systems:

- CP/M-86, a single user, single task operating system
- Concurrent CP/M-86™, a single user, multi-task operating system

If you plan to use GSX-86 with Concurrent CP/M-86, refer to Appendix B for additional information.

## WHO IT IS FOR

This guide is for you if you are a new user of GSX-86 on an IBM® Personal Computer. It will help you set-up your system to run your GSX-86 graphic application programs on any printer, plotter, or monitor you select.

If you are a systems or an applications programmer familiar with the CP/M-86 operating system family, this guide provides you with a list of device drivers.

## WHAT GSX-86 DOES

GSX-86 is a program that adds graphic capability to your CP/M-86 or Concurrent CP/M-86 operating system. With GSX-86 installed, the following features are added to your system:

- GSX-86 provides a device-independent software interface for application programs written for GSX-86. This means that all graphic output devices look the same to your GSX-86 application program. Thus, if you decide to use a printer instead of a plotter, you do not need to alter your GSX-86 application program.
• GSX-86 promotes software portability. By using the same architecture as the CP/M-86 operating system family, GSX-86 allows you to easily transfer GSX-86 graphic application programs from one computer to another.

• GSX-86 supports DR Graph™ and DR Draw™. DR Graph allows you to graph and plot data by making simple menu selections. DR Draw allows you to draw complex graphics with your computer.

HOW IT IS ORGANIZED

This guide is divided into four sections.

Section 1 is an overview of GSX-86 that describes GSX-86 and how your system uses it.

Section 2 explains set-up procedures for the first time you use GSX-86, and for changing the graphic devices on your system.

Section 3 describes how to install GSX-86 before you use a graphic application program. It also contains an operation checklist.

Section 4 lists device-dependent information for all the graphic devices supported by this release of GSX-86.
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Section 1
OVERVIEW

INTRODUCTION
This section describes GSX-86 and how it operates with your computer system. The concepts in this section provide background information for the operating procedures in the next two sections.

GSX-86 FUNCTIONS
All graphic devices (monitors, printers, and plotters) draw lines, fill in areas, and produce text differently. GSX-86, the Graphic System Extension to CP/M-86 and Concurrent CP/M-86, manages these device differences and ensures that your GSX-86 graphic application programs can communicate with a variety of graphic output devices.

Coordinate Transformation
When you communicate to your graphic device through GSX-86, all graphic images are represented in a two-dimensional, cartesian coordinate system. GSX-86 transforms the coordinates of lines and text from the GSX-86 application program into the coordinates used by the selected output device. With GSX-86, your application program produces the same graphic image on your printer that appears on your monitor; the linestyles, characters, and so forth appear the same on both devices.
GSX-86 User's Guide

GSX-86 Provides Device-independent Graphics

Application programs written for GSX-86 work with GSX-86 through a standard graphic interface. GSX-86 translates the calls generated by the application program to fit the peculiarities of each output device. This means that GSX-86 graphic application programs can run on a wide range of monitors, plotters, and printers.
Device Drivers

Because each graphic device is mechanically and electronically different, each device requires a special program to establish communication between it and GSX-86. This program is called a device driver.

The device drivers define the types of graphic output devices your computer can operate. The GSX-86 ASSIGN.SYS file, described in Section 2, contains the device driver filename for each output device attached to your computer. If you decide to connect another type of printer to your system, simply change the printer device driver in your ASSIGN.SYS file. Section 4 lists the device drivers that you receive with GSX-86.

End of Section 1
Section 2
SET-UP PROCEDURES

| INTRODUCTION | This section describes the procedures for the following:
|              | • installing GSX-86 the first time you use GSX-86 with your system
|              | • modifying the ASSIGN.SYS file when you change the type of devices attached to your computer

| STARTING YOUR SYSTEM | Set up the printer, plotter, monitor, and any other hardware for your system. Your IBM Guide to Operations manual explains how to install and start your system.

| CHECKING YOUR GSX-86 DISTRIBUTION DISK | Insert the GSX-86 distribution disk into one of your computer's disk drives. Use the DIR command documented in your CP/M-86 Operating System User's Guide to list the contents of the disk.
|                                       | Your disk should contain the following files:
|                                       | • ASSIGN.SYS
|                                       | • GRAPHICS.CMD
|                                       | • at least one device driver file for each monitor, printer, or plotter connected to your computer
ASSIGN.SYS File

ASSIGN.SYS is the device driver assignment file. It contains the list of device drivers that operate your computer's graphic output devices.

GRAPHICS.CMD File

GRAPHICS.CMD is the file containing GSX-86.

Device Driver Files

As explained in Section 1, device drivers are programs that allow your computer to operate with the specific graphic output devices connected to it. Ensure that all of the following device driver files are on your distribution disk:

- DDIDSM.SYS
- DDOMM84.SYS
- DDPMVP.SYS
- DDFXLR8.SYS
- DDFXHR8.SYS
- DDCTXM.SYS
- DDLA100.SYS
- DDLA50.SYS
- DDCITILR.SYS
- DDDS180.SYS
- DDADXM.SYS
- DDHP7470.SYS
- DDIBM.SYS
- DDIBMC.SYS

If any files are missing, ask your distributor for a new disk.
DUPLICATING YOUR DISTRIBUTION DISK

If all of the device driver files are present, use the Disk Maintenance command, DSKMAINT, to make a duplicate copy of your distribution disk. See your CP/M-86 or Concurrent CP/M-86 Operating System User's Guide for instructions on the use of DSKMAINT.

After making a duplicate disk, store your distribution disk in a safe place, away from extreme heat, temperature changes, humidity, and dust.

CREATING A WORKING DISK

Turn to the Device Driver Quick Reference Table in Section 4 and look up the device driver filename for each graphic output device connected to your computer. Use the PIP utility in your CP/M-86 Operating System User's Guide to copy these specific device driver files, along with ASSIGN.SYS and GRAPHICS.CMD, from your duplicate disk to a working disk.

For example, if you have a Centronics 351 printer and an IBM color monitor, you would copy the following files from your duplicate disk to your working disk:

- DDCNTXM.SYS
- DDIBMC.SYS
- ASSIGN.SYS
- GRAPHICS.CMD

If your computer is equipped with a fixed disk drive (hard disk), copy the necessary device driver files, GRAPHICS.CMD, ASSIGN.SYS, CP/M-86 and your application programs onto the fixed disk.

Note: Always use your duplicate disk to make copies of GSX-86 files. Do not use the distribution disk for routine operations.
LISTING THE ASSIGN.SYS FILE

Insert your working disk into your computer's currently logged disk drive and list the ASSIGN.SYS file by entering

A>TYPE ASSIGN.SYS

The letter preceding the system prompt denotes the currently logged disk drive. In the example above, drive A is the currently logged drive.

A list similar to the following appears on the screen.

```
21 DDFXHR8.SYS
01 DDIBM.SYS
11 DDHP7470.SYS
```

Figure 2-1. Display of ASSIGN.SYS File in Drive A

Logical Device Number

Look at the specific entries in your ASSIGN.SYS file. The number at the beginning of each line is the logical device number; it must contain two digits. The range of logical device numbers is fixed for various types of devices as shown in the following table.
Table 2-1. Logical Device Number Assignments

<table>
<thead>
<tr>
<th>Output Device</th>
<th>Logical Device Number Range</th>
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</thead>
<tbody>
<tr>
<td>Monitor</td>
<td>01-10</td>
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<td>Plotter</td>
<td>11-20</td>
</tr>
<tr>
<td>Printer</td>
<td>21-30</td>
</tr>
</tbody>
</table>

The device numbers you assign to the device drivers in your ASSIGN.SYS file must match those used in your GSX-86 graphics application program. As a general rule, assign 01 to your monitor, 11 to your plotter and 21 to your printer. However, this may vary depending on the GSX-86 application program you have.

Device Driver Filename

Following the logical device number is the filename of the device driver. See Section 4 for a list of device drivers and their filenames.

Syntax Rule

Each ASSIGN.SYS entry consists of a two-digit logical device number, a blank space, and a device driver filename. If no filetype extension is specified after the device driver filename, GSX-86 assumes the filetype is SYS.
Before GSX-86 can be used, you must ensure that the device drivers listed in the ASSIGN.SYS file are the correct ones for your computer system. Turn to the Device Driver Quick Reference Table in Section 4 and look up the device driver filename for each graphic output device connected to your computer. If the device driver filenames listed in the ASSIGN.SYS file do not match those listed in Section 4, you must modify the ASSIGN.SYS file before you use GSX-86.

To alter logical device numbers or device driver filenames in the ASSIGN.SYS file, use a text editor to edit the ASSIGN.SYS file. For editing instructions, see the user's guide for the editor you are using.

Follow these guidelines when you edit your ASSIGN.SYS file.

Ensure that the largest device driver is listed first in your ASSIGN.SYS file. The device drivers are loaded into memory in the order listed in the ASSIGN.SYS file. Loading the largest device driver first ensures enough room is reserved for any of the other drivers in the ASSIGN.SYS file.

Typically, the device driver file used for your printer is the largest; the driver file for your plotter is the next largest; and the driver file for your monitor is the smallest. If in doubt, see your CP/M-86 Operating System User's Guide for the command used to determine the size of your files.

If your disk does not have sufficient storage space for the ASSIGN.SYS file and the device driver files, you can put them on separate disks. If you do put your device driver files on a different disk than your ASSIGN.SYS file, you must modify the ASSIGN.SYS file to specify which drive contains the disk with the device driver files. This is done using the following format:

<Device Number> <Disk Drive>:<Filename>
For example, if the disk containing the ASSIGN.SYS file is in drive A and the disk containing the device driver files is in drive B, your ASSIGN.SYS file would look like the following:

```
21 B:DDFXHR8.SYS
01 B:DDIBM.SYS
11 B:DDHP7470.SYS
```

Figure 2-2. Display of ASSIGN.SYS File in Drive B.

You can include up to five device drivers in your ASSIGN.SYS file.

End of Section 2
Section 3
GSX-86 GRAPHICS MODE

INTRODUCTION
This section explains how to install GSX-86 before you use a graphic application program.

INSTALLING GSX-86
The GRAPHICS command installs GSX-86. Before you can use a graphic application program, you must load GSX-86 and the first device driver from your ASSIGN.SYS file into your computer's memory. Typing GRAPHICS loads both into memory.

After you start your system and receive the system prompt, type a command of the form:

<d>:GRAPHICS

The <d> symbol represents the letter of the drive in which the GSX-86 working disk is located.

For example, if you type

A>A:GRAPHICS

the computer searches drive A for the disk containing GRAPHICS.CMD and the ASSIGN.SYS file.
If you type

A>B:GRAPHICS

the system searches drive B for the disk containing GRAPHICS.CMD and the ASSIGN.SYS file.

If you type

B>GRAPHICS

without specifying a drive, the system searches the disk in the currently logged-in drive. The letter before the ">" prompt indicates which disk drive is currently logged in and being accessed. The B>GRAPHICS command tells the system to search drive B for the disk containing GRAPHICS.CMD and the ASSIGN.SYS file.

When you install GSX-86 correctly, you receive the message:

GSX-86 installed; <filename> is dddd bytes long at XXXX.OOOO

Here, <filename> is the filename of the first device driver in the ASSIGN.SYS file and dddd is its size, which you should note for making any changes to the ASSIGN.SYS file. For details on the ASSIGN.SYS file, see Section 2, Modifying The ASSIGN.SYS File.

---

DISABLING GSX-86

When you are not using graphics, you can disable GSX-86 by typing:

A>GRAPHICS NO

This command frees the memory space formerly used by GSX-86 and the device driver.
When you disable GSX-86 correctly, you receive the message:

GSX-86 not installed

You might also receive this message if something prevents you from installing GSX-86.

**WARM AND COLD STARTS**

If you are running an application program and you decide to terminate the run, you can exit the program by

- Pressing both the CTRL key and C key at the same time. This is called a warm start of your computer and it will not disturb the GSX-86 installation.

- Restarting your computer by either turning it off and back on again, or pressing its reset button. This is called a cold start, which disables both CP/M-86 and GSX-86. To reinstall GSX-86, you must reboot CP/M-86 or Concurrent CP/M-86 and reenter the GRAPHICS command.

**ERROR MESSAGES**

If you type the GRAPHICS command incorrectly, what you originally typed appears on the screen followed by a question mark (?). If you receive such a message, check the exact command syntax and type the command again. If you continue to receive this error message, use the DIR command to list the contents of your currently logged disk. If the GRAPHICS.CMD file is not on the disk, locate the correct disk, insert it into the currently logged drive, and reenter the GRAPHICS command.

If you make an error after entering GSX-86, an error message appears on your screen. Refer to Appendix A for a definition of the error messages and the recommended action for recovery.
OPERATION CHECKLIST

☐ Are the hardware components properly attached to your computer?

☐ Does the distribution disk contain the files you need?

☐ Did you duplicate the distribution disk and store it safely away from heat, extreme temperature changes, dust, and humidity?

☐ Is the disk containing GRAPHICS.CMD, ASSIGN.SYS, and the correct device drivers on the drive you specify in the GRAPHICS command?

☐ If you have your device drivers and your ASSIGN.SYS file on a separate disk, does your ASSIGN.SYS file specify which drive contains the disk with your device drivers?

☐ Is the logical device number 01 assigned to your monitor, 11 to the plotter, and 21 to the printer?

☐ Is the largest device driver listed first in the ASSIGN.SYS file?

☐ Have you typed the GRAPHICS command to load GSX-86 and the first driver into memory?

End of Section 3
INTRODUCTION

This section describes the graphics device drivers available for GSX-86.

The first part of this section discusses the printer drivers, the second part discusses the HP 7470A plotter driver, and the third part discusses the monitor drivers.

For quick reference of the device driver types and the filenames associated with them, see the table below.

**Table 4-1. Device Driver Quick Reference Table**

<table>
<thead>
<tr>
<th>Printers</th>
<th>Filename</th>
<th>Device Number Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anadex ® DP-9501 and DP-9001A</td>
<td>DDANADXM.SYS</td>
<td></td>
</tr>
<tr>
<td>Centronics 351, 352 and 353</td>
<td>DDCNTXM.SYS</td>
<td></td>
</tr>
<tr>
<td>C.ITOH 8510A Low Resolution</td>
<td>DDCITOLR.SYS</td>
<td></td>
</tr>
<tr>
<td>Datasouth DS180</td>
<td>DDDS180.SYS</td>
<td></td>
</tr>
<tr>
<td>DEC ® LA50</td>
<td>DDLA50.SYS</td>
<td></td>
</tr>
<tr>
<td>DEC LA100</td>
<td>DDLA100.SYS</td>
<td>21-30</td>
</tr>
<tr>
<td>Epson® Low Resolution (8 bit)</td>
<td>DDFXLR8.SYS</td>
<td></td>
</tr>
<tr>
<td>Epson High Resolution (8 bit)</td>
<td>DDFXHR8.SYS</td>
<td></td>
</tr>
<tr>
<td>IDS Monochrome</td>
<td>DDIDSM.SYS</td>
<td></td>
</tr>
<tr>
<td>OKIDATA Microline</td>
<td>DDKI84.SYS</td>
<td></td>
</tr>
<tr>
<td>Printronix ® MVP™</td>
<td>DDPMVP.SYS</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Plotter</th>
<th>Filename</th>
<th>Device Number Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>HP 7470A</td>
<td>DDHP7470.SYS</td>
<td>11-20</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Monitors</th>
<th>Filename</th>
<th>Device Number Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBM Color</td>
<td>DDIBMC.SYS</td>
<td>01-10</td>
</tr>
<tr>
<td>IBM Monochrome</td>
<td>DDIBM.SYS</td>
<td></td>
</tr>
</tbody>
</table>
PRINTER DRIVERS

Introduction
The following information applies to all of the printer drivers listed in this section.

Device Number
The logical device numbers for printers range from 21 to 30. When you use only one printer, assign it device number 21.

Linestyle
The printers support six linestyles. Each linestyle is identified by an index number (see the following table). The driver uses linestyle 1, a solid line, when you specify a linestyle index number outside the 1-6 range.

<table>
<thead>
<tr>
<th>Index</th>
<th>Linestyle</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Solid</td>
</tr>
<tr>
<td>2</td>
<td>Short Dash</td>
</tr>
<tr>
<td>3</td>
<td>Dot</td>
</tr>
<tr>
<td>4</td>
<td>Dash-Dot</td>
</tr>
<tr>
<td>5</td>
<td>Long Dash</td>
</tr>
<tr>
<td>6</td>
<td>Dash-Dot-Dot</td>
</tr>
</tbody>
</table>

Markers
The printers support 12 marker sizes and 5 marker types.

- Marker sizes range from 7 to 84 pixels in height, in 7-pixel increments.

- Each marker type is identified by an index number (see the following table). The driver uses marker type 3 (*) when you specify a marker index number outside the 1-5 range.

<table>
<thead>
<tr>
<th>Number</th>
<th>Marker</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.</td>
</tr>
<tr>
<td>2</td>
<td>+</td>
</tr>
<tr>
<td>3</td>
<td>*</td>
</tr>
<tr>
<td>4</td>
<td>O</td>
</tr>
<tr>
<td>5</td>
<td>X</td>
</tr>
</tbody>
</table>
The printers support 12 character sizes, from 7 to 84 pixels in height, in 7-pixel increments. Text can be rotated in 90-degree increments.

The area in a polygon can be filled with a hatch or halftone pattern.

The printers support the following two fill patterns.

<table>
<thead>
<tr>
<th>Index</th>
<th>Hatch Patterns</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Vertical lines</td>
</tr>
<tr>
<td>2</td>
<td>Horizontal lines</td>
</tr>
<tr>
<td>3</td>
<td>+45 degree lines</td>
</tr>
<tr>
<td>4</td>
<td>-45 degree lines</td>
</tr>
<tr>
<td>5</td>
<td>Both vertical and horizontal crosshatch</td>
</tr>
<tr>
<td>6</td>
<td>Both 45 and -45 degree crosshatch</td>
</tr>
</tbody>
</table>

Figure 4-1. Printer Hatch Patterns
Halftone Patterns:

The printer drivers have six halftone fill patterns that simulate six different levels of the gray scale.

![Halftone Patterns Diagram]

Figure 4-2. Printer Halftone Patterns

Cell Array

Printers outline the cell array in the current line color with a solid line.

Generalized Drawing Primitives (GDPS)

Printer Drivers support only the GSX-86 BAR GDP; its identifier is 1.

Color

The MONOCHROME printers support two colors:

0 = White (background color)
1 = Black

All color indexes other than 0 are displayed as index 1 (black). You cannot redefine the printer's color indexes with the GSX-86 Set Color Representation function.
Escapes
The only escape function available on the printer is the GSX-86 Inquire Addressable Character Cells function; its identifier is 1.

Word Length
Computers communicate with printers using either 7 or 8 data bits for each transmitted character. The number of data bits used for each character is called the "word length."

If your computer is connected through a parallel port to your printer, the word length your printer uses is not important. However, if your computer is connected to your printer through a serial RS-232C port, you must determine the word length used by both your computer and your printer. The CONFIG command, documented in your CP/M-86 or Concurrent CP/M-86 for the IBM Personal Computer Operating System manual, allows you to determine the current word length used by your computer and, if necessary, allows you to change it. The word length used by your printer should be documented in your printer's hardware manual. If your printer uses a word length of 7, your computer and the printer driver you select must also use a word length of 7. If your printer uses a word length of 8, your computer and the selected printer driver must also use a word length of 8.

Graphic Input
Printers do not support graphic input.
**ANADEX PRINTERS:**
- MODEL DP-9501
- MODEL DP-9001A

<table>
<thead>
<tr>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filename</td>
<td>DDANADXM.SYS</td>
</tr>
<tr>
<td>Resolution Horizontal</td>
<td>75 dots per inch</td>
</tr>
<tr>
<td>Vertical</td>
<td>72 dots per inch</td>
</tr>
<tr>
<td>Maximum Plot Size</td>
<td>8 x 9.5 inches (600 x 672 dots)</td>
</tr>
<tr>
<td>Word Length</td>
<td>7 bits per byte from the computer</td>
</tr>
</tbody>
</table>
### CENTRONICS PRINTERS
- **MODEL 351**
- **MODEL 352**
- **MODEL 353**

<table>
<thead>
<tr>
<th>Filename</th>
<th>DDCNTXM.SYS</th>
</tr>
</thead>
</table>
| Resolution  | Horizontal: 66 dots per inch  
              Vertical: 72 dots per inch |
| Maximum Plot Size | 8 x 9.5 inches (528 x 672 dots) |
| Word Length | 7 bits per byte from the computer |
C.ITOH MODEL 8510A PRINTER

<table>
<thead>
<tr>
<th>Filename</th>
<th>DDCITOLR.SYS</th>
</tr>
</thead>
</table>
| Resolution     | Horizontal: 136 dots per inch (17 cpi pitch)  
<p>|                | Vertical: 72 dots per inch |
| Maximum Plot Size | 8 x 9.5 inches (1088 x 672 dots) |
| Word Length    | 8 bits per byte from the computer. |</p>
<table>
<thead>
<tr>
<th><strong>Filename</strong></th>
<th>DDDS180.SYS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Resolution</strong></td>
<td>Horizontal: 75 dots per inch</td>
</tr>
<tr>
<td></td>
<td>Vertical: 72 dots per inch</td>
</tr>
<tr>
<td><strong>Maximum Plot Size</strong></td>
<td>8 x 9.5 inches (600 x 672 dots)</td>
</tr>
<tr>
<td><strong>Word Length</strong></td>
<td>7 bits per byte from the computer</td>
</tr>
</tbody>
</table>
### DIGITAL EQUIPMENT CORPORATION LA50 PRINTER

<table>
<thead>
<tr>
<th><strong>Filename</strong></th>
<th>DDLA50.SYS</th>
</tr>
</thead>
</table>
| **Resolution**   | Horizontal: 144 dots per inch  
                  | Vertical: 72 dots per inch |
| **Maximum Plot Size** | 8 x 9.5 inches (1152 x 672 dots) |
| **Word Length**  | 7 bits per byte from the computer |
**DIGITAL EQUIPMENT CORPORATION LA100 PRINTER**

<table>
<thead>
<tr>
<th>Filename</th>
<th>DDLA100.SYS</th>
</tr>
</thead>
</table>
| Resolution     | Horizontal: 132 dots per inch  
                 | Vertical: 72 dots per inch     |
| Maximum Plot Size | 8 x 9.5 inches (1056 x 672 dots)   |
| Word Length    | 7 bits per byte from the computer |
EPSON PRINTERS:  
MX-80™ WITH GRAPTRAX PLUS™  
MX-100™  
FX-80™  
FX-100™

Introduction  
Two drivers exist for the Epson printers. The first supports low resolution graphics and the second supports high resolution graphics.

The low resolution driver prints at over twice the speed of the high resolution driver. Generally, the low resolution driver is best suited for draft output and the high resolution driver for final copy.

Epson Low Resolution

Filename  
DDFXLR8.SYS

Resolution  
Horizontal: 60 dots per inch  
Vertical: 72 dots per inch

Maximum Plot Size  
8 x 9.5 inches (480 x 672 dots)

Word Length  
8 bits per byte from the computer.

Note: When this driver is used for the FX-100 or the MX-100 printer, only the left eight inches of the printer are used.
Epson High Resolution

<table>
<thead>
<tr>
<th>Filename</th>
<th>DDFXHR8.SYS</th>
</tr>
</thead>
</table>
| Resolution     | Horizontal: 120 dots per inch  
                 Vertical: 144 dots per inch |
| Maximum Plot Size | 8 x 9.5 inches (960 x 1368 dots) |
| Word Length    | 8 bits per byte from the computer. |

**Note:** When this driver is used for the FX-100 or the MX-100 printer, only the left eight inches of the printer are used.
INTEGRAL DATA SYSTEMS MONOCHROME PRINTERS:
MICRO PRISM™ MODEL 480
PRISM 80
PRISM 132

Filename                  DDIDSM.SYS
Resolution                Horizontal: 84 dots per inch
                          Vertical: 84 dots per inch
Maximum Plot Size         8 x 9.5 inches (672 x 800 dots)
Word Length               7 bits per byte from the computer
## OKIDATA PRINTERS:
**MICROLINE 92**
**MICROLINE 84 STEP 2**

<table>
<thead>
<tr>
<th><strong>Filename</strong></th>
<th>DDOKI84.SYS</th>
</tr>
</thead>
</table>
| **Resolution**| **Horizontal:** 103 dots per inch (17 cpi pitch)  
**Vertical:** 72 dots per inch |
| **Maximum Plot Size** | 8 x 9.5 inches (824 x 672 dots) |
| **Word Length** | 7 bits per byte from the computer |
## PRINTRONIX MVP PRINTER

<table>
<thead>
<tr>
<th><strong>Filename</strong></th>
<th>DDPMVP.SYS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Resolution</strong></td>
<td>Horizontal: 60 dots per inch</td>
</tr>
<tr>
<td></td>
<td>Vertical: 75 dots per inch</td>
</tr>
<tr>
<td><strong>Maximum Plot Size</strong></td>
<td>8 x 8 inches (480 x 600 dots)</td>
</tr>
<tr>
<td><strong>Word Length</strong></td>
<td>7 bits per byte from the computer</td>
</tr>
</tbody>
</table>
Logical device numbers for plotters range from 11 to 20. When you use only one plotter, assign it device number 11.

The pen holder is the graphic input device. The initial position of the pen holder indicates to your applications program the starting position for the graphic image to be drawn. To move the pen holder, press the arrow keys on the front panel. When the pen holder is at the desired location, press the ENTER button. The coordinates of the pen holder are then transmitted to your applications program.

The HP 7470A has continuous scaling of character sizes. Text can be rotated in one-degree increments.

The plotter supports six linestyles. Each linestyle is identified by an index number (see the following table). The driver uses linestyle 1, a solid line, when you specify a linestyle index number outside the 1-6 range.

<table>
<thead>
<tr>
<th>Index</th>
<th>Linestyle</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Solid</td>
</tr>
<tr>
<td>2</td>
<td>Dot</td>
</tr>
<tr>
<td>3</td>
<td>Short Dash</td>
</tr>
<tr>
<td>4</td>
<td>Long Dash</td>
</tr>
<tr>
<td>5</td>
<td>Dash-Dot</td>
</tr>
<tr>
<td>6</td>
<td>Dash-Dot-Dot</td>
</tr>
</tbody>
</table>
Markers

The plotter supports five marker types. Each marker type is identified by an index number (see the following table). The driver uses marker 3 (*) when you specify a marker index number outside the 1-5 range.

<table>
<thead>
<tr>
<th>Number</th>
<th>Marker</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.</td>
</tr>
<tr>
<td>2</td>
<td>+</td>
</tr>
<tr>
<td>3</td>
<td>*</td>
</tr>
<tr>
<td>4</td>
<td>O</td>
</tr>
<tr>
<td>5</td>
<td>X</td>
</tr>
</tbody>
</table>

Color

The number of the pen, not the number of the pen holder, indicates the color. This allows you to use more than two colors on the plotter. By default, index 1 is held in pen holder 1 and index 2 is held in pen holder 2. If you are using more than these two colors, your applications program will prompt you to insert the third colored pen in a pen holder and enter the pen holder number. No limit exists for the number of pen indexes available on the plotter.
Introduction

The following information applies to all monitor drivers listed in this section.

Device Number

The logical device numbers for monitors range from 01 to 10. If you use only one monitor, assign it device number 01.

Linestyle

The monitors support six linestyles. Each linestyle is identified by an index number (see the following table). The driver will use linestyle 1, a solid line, when you specify a linestyle index number outside the 1-6 range.

Table 4-7. Monitor Linestyles

<table>
<thead>
<tr>
<th>Index</th>
<th>Linestyle</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Solid</td>
</tr>
<tr>
<td>2</td>
<td>Short Dash</td>
</tr>
<tr>
<td>3</td>
<td>Dot</td>
</tr>
<tr>
<td>4</td>
<td>Dash-Dot</td>
</tr>
<tr>
<td>5</td>
<td>Long Dash</td>
</tr>
<tr>
<td>6</td>
<td>Dash-Dot-Dot</td>
</tr>
</tbody>
</table>

Markers

The monitors support 182 marker sizes and 5 marker types.

- Marker sizes range from 8 to 190 pixels, in 1 pixel increments.

- Each marker type is identified by an index number (see list below). The driver will use marker 3 (*) when you specify a marker index number outside the 1-5 range.
Table 4-8. Monitor Marker Sizes

<table>
<thead>
<tr>
<th>Number</th>
<th>Marker</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.</td>
</tr>
<tr>
<td>2</td>
<td>+</td>
</tr>
<tr>
<td>3</td>
<td>*</td>
</tr>
<tr>
<td>4</td>
<td>O</td>
</tr>
<tr>
<td>5</td>
<td>X</td>
</tr>
</tbody>
</table>

Text

The IBM PC supports 182 character sizes from 8 to 190 pixels, in 1 pixel increments. Text can be rotated in 90 degree increments.

Fill Area

The area within a polygon can be filled with a hatch or halftone pattern.

Fill Styles

The monitors support the following two fill patterns.

Table 4-9. Monitor Hatch Patterns

<table>
<thead>
<tr>
<th>Index</th>
<th>Hatch Patterns</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Vertical lines</td>
</tr>
<tr>
<td>2</td>
<td>Horizontal lines</td>
</tr>
<tr>
<td>3</td>
<td>+45 degree lines</td>
</tr>
<tr>
<td>4</td>
<td>-45 degree lines</td>
</tr>
<tr>
<td>5</td>
<td>Both vertical and horizontal crosshatch</td>
</tr>
<tr>
<td>6</td>
<td>Both 45 and -45 degree crosshatch</td>
</tr>
</tbody>
</table>
Halftone Patterns:

The monitor drivers have six halftone fill patterns that simulate six different levels of the gray scale.

Figure 4-3. Monitor Hatch Patterns

Figure 4-4. Monitor Halftone Patterns
<table>
<thead>
<tr>
<th>Generalized Drawing Primitives (GDPS)</th>
<th>Monitor drivers support the GSX-86 BAR GDP only; its identifier is 1.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Escapes</td>
<td>All standard GSX-86 escapes are supported by the monitor drivers.</td>
</tr>
<tr>
<td>Graphic Input</td>
<td>Some GSX-86 application programs require you to select specific coordinates on your monitor screen. GSX-86 allows you to move the graphic cursor on the screen to a desired location and input its coordinates to the application program. When GSX-86 Graphic Input (GIN) is invoked on the IBM PC, a graphic cursor resembling a plus sign (+) appears on the screen. You can move the graphic cursor up, down, left, and right by pressing one of the 4 arrow keys on the numeric keypad at the right-hand side of the keyboard. You can also move the graphic cursor in 45 degree angles by pressing the 7, 9, 1, and 3 keys on the numeric keypad. Initially, the cursor moves in large increments. Pressing the INS key changes the distance between large and small movements. When the cursor is at the desired location, you can select the point by pressing any alphanumeric key (other than return) on the keyboard. This transmits the coordinates of the point to the current program.</td>
</tr>
</tbody>
</table>
IBM PC (Medium Resolution Color)

Filename: DDIBMC.SYS
Resolution: Horizontal: 320 dots
Vertical: 200 dots
Color: The IBM PC in medium resolution color mode supports four colors. The color indexes cannot be redefined to other colors. The default association of color indexes with color is listed in the following table.

Table 4-10. IBM PC Color Index

<table>
<thead>
<tr>
<th>Index</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Black</td>
</tr>
<tr>
<td>1</td>
<td>Red</td>
</tr>
<tr>
<td>2</td>
<td>Green</td>
</tr>
<tr>
<td>3</td>
<td>Yellow</td>
</tr>
</tbody>
</table>
IBM PC (High Resolution Monochrome)

Filename: DDIBM.SYS

Resolution: Horizontal: 640 dots
           Vertical: 200 dots

Color: In high resolution monochrome mode, the IBM PC supports only two colors: black and white. Color indexes cannot be redefined. The default association of color indexes with monochrome intensity is listed in the following table.

<table>
<thead>
<tr>
<th>Index</th>
<th>Intensity</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0%</td>
<td>Black</td>
</tr>
<tr>
<td>1</td>
<td>100%</td>
<td>White</td>
</tr>
</tbody>
</table>

End of Section 4
Appendix A
GSX-86 ERROR MESSAGES

The following error messages might appear when you use GSX-86.

Table A-1. GSX-86 Error Messages

<table>
<thead>
<tr>
<th>Message</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>d: ASSIGN.SYS not found</td>
<td>The ASSIGN.SYS file cannot be found on the disk in the currently logged drive. Use the DIR command to list the contents of the disk. If the ASSIGN.SYS file is not on the disk, locate the disk containing the ASSIGN.SYS file; insert it into the drive; and type the GRAPHICS command.</td>
</tr>
<tr>
<td>d: ASSIGN.SYS syntax error</td>
<td>An entry in the ASSIGN.SYS file does not follow the syntax rule. The entry does not contain a two digit logical device number, a blank space, and a device driver filename. Edit the ASSIGN.SYS file and make the necessary corrections. Type the GRAPHICS command again.</td>
</tr>
<tr>
<td>d: ASSIGN.SYS close error</td>
<td>The system cannot find the file to close it. This sometimes happens when you exchange the disk that was previously in the drive with another disk. Insert the correct disk in the drive and try again.</td>
</tr>
<tr>
<td>d: ffffffff.SYS not found</td>
<td>One of the device driver files listed in the ASSIGN.SYS file is not on the working disk. Use the DIR command to list the contents of the working disk. Ensure that</td>
</tr>
</tbody>
</table>
### Table A-1. (continued)

<table>
<thead>
<tr>
<th>Message</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>all of the device driver files listed in the ASSIGN.SYS file are present on the disk. If a device driver file listed in the ASSIGN.SYS file is on the working disk, copy the missing device driver file onto it.</td>
<td></td>
</tr>
<tr>
<td>d:fffffff.SYS empty</td>
<td>The system found the specified device driver, but it contains no data. Delete the empty file from your working disk and recopy the original file from your duplicate disk to your working disk. For details, see Creating a Working Disk in Section 2.</td>
</tr>
<tr>
<td>d:fffffff.SYS contains absolute segment</td>
<td>The specified device driver file attempted to address an absolute segment and it cannot be loaded. This is probably the result of a corrupted driver file. Recopy the original file from your duplicate disk to your working disk.</td>
</tr>
<tr>
<td>d:fffffff.SYS close error</td>
<td>An error occurred when the system closed the specified file. This probably happened because you exchanged the disk that was previously in the drive with another disk. Insert the correct disk in the drive and try again.</td>
</tr>
<tr>
<td>d:fffffff.SYS load error</td>
<td>An error occurred while the system was reading the device driver file. This occurs if you fail to list the largest device driver first in the ASSIGN.SYS file. Reedit the ASSIGN.SYS file and list the largest driver first.</td>
</tr>
</tbody>
</table>
Table A-1. (continued)

<table>
<thead>
<tr>
<th>Message</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not enough memory for GSX-86</td>
<td>Your computer does not have enough memory for GSX-86 and the default device driver. Disable unnecessary programs to free memory or add more RAM memory to your system.</td>
</tr>
</tbody>
</table>

End of Appendix A
Appendix B
OPERATING GSX-86 WITH CONCURRENT CP/M-86

INTRODUCTION

Concurrent CP/M-86 allows you to simultaneously run multiple programs from four separate virtual consoles. However, when you use Concurrent CP/M-86 with GSX-86, the following restrictions exist.

USE OF RUN COMMAND

Note the version number on the label of your Concurrent CP/M disk.

- If you use GSX-86 with the 2.0 version of Concurrent CP/M, do not use the RUN command when you initiate your GSX-86 application programs. For example, to initiate DR GRAPH, type the command:

  A>GRAPH

- If you use GSX-86 under the 1.0 or 1.1 version of Concurrent CP/M, use the RUN command when you initiate your GSX-86 application programs. For example, to initiate DR GRAPH, type the command:

  A>RUN GRAPH

PLOTTER SUPPORT

When your computer is running the Concurrent CP/M-86 operating system, GSX-86 does not support the HP 7470A Plotter.

MONITOR CONNECTIONS

Before running your graphics application program on your IBM computer, you must have both the standard IBM PC monochrome monitor and a graphics monitor connected to your computer.

- Connect your graphics monitor to the output port of the Color/Graphics Monitor Adapter at the rear of your computer.
- Connect your monochrome monitor to the output port of the Monochrome Display/Printer Adapter at the rear of your computer.

**USE WITH DR GRAPH**

Although Concurrent CP/M-86 allows you to run multiple programs simultaneously, you can run only one DR Graph program at a time.

**UNLOADING OPERATING SYSTEM EXTENSIONS**

GSX-86 is a system extension of the CP/M-86 and Concurrent CP/M-86 operating systems. If another system extension and GSX-86 are both loaded for concurrent operation, they must be unloaded (or disabled) in the reverse order that they were loaded. For example, if GSX-86 was loaded before the other system extension, you would unload that system extension before GSX-86.

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Reader Comment Card

We welcome your comments and suggestions. They help us provide you with better product documentation.

Date ___________ First Edition: July 1983

1. What sections of this manual are especially helpful?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

2. What suggestions do you have for improving this manual? What information is missing or incomplete? Where are examples needed?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

3. Did you find errors in this manual? (Specify section and page number.)

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________


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