IBM

Introducing the IBM 3270 Personal Computer/G and /GX Work Stations

Federal Communications Commission (FCC) Statement

Warning: This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

In addition to the above FCC statement, the user should be aware that:

- The statement applies only to IBM 3270 Personal Computers used in the United States.

- The phrase "instructions manual" means this manual and and *IBM 3270 Personal Computer/G: Guide to Operations for Work Stations that Use the IBM 5279 Color Display*, SA33-3140, or *IBM 3270 Personal Computer/GX: Guide to Operations for Work Stations that Use the IBM 5379 Display*, SA33-3139.

Preface

This manual introduces the IBM 3270 Personal Computer/G and /GX Work Stations. The contents of this manual will be especially useful if you are an executive, organization and methods manager, administrative services manager, data processing manager, planner, or IBM marketing representative.

The manual has two parts:

- Part 1 gives information that will help you to understand the work stations, and to appreciate the benefits that they can offer to your organization.

  - Chapter 1 gives a general description of the work stations and the IBM Graphics Control Program.

  - Chapter 2 gives examples of typical applications for the work stations.

  - Chapter 3 describes the work station components.

  - Chapter 4 describes the graphics control program and the functions it provides.

  - Chapter 5 provides information about the software environments in which the work stations operate.

- Part 2 gives information to help the planners in your organization choose the appropriate work stations, and to prepare for them.

  - Chapter 6 gives information to help your planners choose the most suitable work station configuration for your applications.

  - Chapter 7 describes the work that should be done before the work station is delivered.

  - Appendix A gives information about attaching to and customizing an IBM 3274 Control Unit.

  - Appendix B describes some compatibility considerations for your 3270-PC/G or /GX work station.

  - Appendix C contains some typical scenarios for work station configurations.

– Appendix D gives detail of GDDM Release 4 performance improvements with the work stations.

– Appendix E contains tables to help you calculate your memory requirements.

A glossary and an index are included at the back of the manual.

Related Publications

- *IBM 3270 Personal Computer/G: Guide to Operations for Work Stations that Use the IBM 5279 Color Display*, SA33-3140

- *IBM 3270 Personal Computer/GX: Guide to Operations for Work Stations that Use the IBM 5379 Display*, SA33-3139

- *IBM 3270 Personal Computer/G or /GX: Graphics Control Program; User's Guide*, SC33-0180

- *IBM 3270 Personal Computer/G or /GX: Graphics Control Program; Work Station Programmer's Guide and Reference*, SC33-0181

- *IBM 3270 Personal Computer/G or /GX: Graphics Control Program; PASCAL Programmer's Reference*, SC33-0210

- *IBM 3270 Personal Computer/G: Maintenance Information for Work Stations that Use the IBM 5279 Color Display*, SY33-0112

- *IBM 3270 Personal Computer/GX: Maintenance Information for Work Stations that Use the IBM 5379 Display*, SY33-0111

- *IBM 3270 Information Display System: 3274 Control Unit Planning, Setup, and Customizing Guide*, GA27-2827

- *IBM 3270 Information Display System: 3274 Control Unit Customizing Guide: Configuration D*, GA23-0065

- *IBM 3270 Information Display System: 3274 Control Unit Site Planning and Preparation Guide*, GA23-0064

- *IBM 3270 Information Display System: 3274 Control Unit Description and Programmer's Guide*, GA23-0061

- *IBM 3270 Information Display System: Data Stream Programmer's Reference*, GA23-0059

- *An Introduction to the IBM 3270 Information Display System*, GA27-2739

- *Graphical Data Display Manager: General Information*, GC33-0100

Contents

Figure 9. CAD/CAM Picture Reproduced on 5379 Screen

CAD/CAM[1] graphics are widely used by high-technology companies. The high-function equipment (for example, the IBM 3250 Graphics Display System or the IBM 5080 Graphics System) needed to view or print the drawings is usually confined to a particular department of an organization. For people outside that department who frequently need access to the drawings for short-term viewing, this can be a problem. Now, with a 3270-PC/G or /GX work station and GDDM, these "outsiders" can view the drawings in their own departments and, if necessary, produce printed copies on a locally-attached printer. They can also use their work stations to alter, annotate, and print other versions of the original pictures.

---

[1] CAD/CAM, Computer Aided Design/Computer Aided Manufacture, is a system whereby engineering drawings are created on high-function graphics terminals, and held and updated on a computer data base. They can finally be passed to computer-controlled machine tools for manufacture.

Figures

Part 1. How Can an IBM Graphics Work Station Help You?

This part of the manual gives information that will help you to understand the work stations, and to appreciate the benefits that they can offer to your organization. This part describes the hardware and software, and shows examples of the types of application that you can run on the work stations.

Figure 1. The Work Stations

Chapter 1. Introduction

The IBM 3270 Personal Computers are a family of work stations for professionals. They meet the needs both for interactive computing connected to a host computer and for local, personal computing. They effectively combine the advantages of the IBM 3270 family of terminals with those of the IBM Personal Computer.

The IBM 3270-PC/G and 3270-PC/GX are additional work stations in this family. They provide comprehensive graphics facilities, both for host-interactive applications and for personal computer applications. These graphics capabilities are additional to the other family functions, such as advanced screen management and the ability to run multiple sessions concurrently.

An IBM 3270-PC/G or 3270-PC/GX work station consists of:

- A display device and its associated display attachment unit

- A system unit

- A keyboard

- Optional attachments

- A graphics control program.

The Displays

There are three displays to choose from:

- The IBM 5279 Color Display

  - 14-inch screen with a 720 x 512 dot matrix, all points addressable

  - up to eight colors

  - up to 3920 characters in 80 columns by 49 rows.

- The IBM 5379 Model C01 Display

  - 19-inch screen with a 960 x 1000 dot matrix, all points addressable

  - up to sixteen colors

- up to 4000 characters in 80 columns by 50 rows.

- The IBM 5379 Model M01 Display

  - 19-inch screen with a 960 x 1000 dot matrix, all points addressable

  - monochrome, with four different levels of tone

  - up to 4000 characters in 80 columns by 50 rows.

The IBM 5279 Display is always coupled with an IBM 5278 Display Attachment Unit.

The IBM 5379 Display is always coupled with an IBM 5378 Display Attachment Unit, which contains in addition a **graphics processor**, giving enhanced graphics performance.

The three displays, together with their display attachment units, thus offer a choice of screen size, color capability, and graphics drawing speed to suit various application needs. Their **all-points-addressable** screens give greatly enhanced graphics and image capability. They support 3270 alphanumeric application programs running in the host, including programs written in APL. They also emulate the Color Graphics Adapter of the IBM PC.

The System Units

There are three different models of the IBM 5371 System Unit to choose from: the Model 12, the Model 14, and the Model 16.

Each model can be used with either the IBM 5279 or the IBM 5379 Display. The system unit provides for attachment to a host through an IBM 3274 Control Unit. It also provides the IBM PC environment for local computing and permits the attachment of other devices to the work station. The different models offer a choice of storage sizes and local disk and diskette files.

Attachments

The following equipment can be attached to the work stations:

- An IBM 5371 keyboard, in standard or APL version.

- The IBM 5182 Personal Computer Color Printer, the IBM 5152 Monochrome Printer, or the IBM 3852 Color Ink Jet Printer.

- An IBM 5083 Model 2 Tablet or an IBM 5277 Mouse, for input to graphics application programs.

- An IBM 7371, 7372, 7374, or 7375 Color Plotter.

- With the IBM 5379 Display, an IBM 5151 Monochrome Display as a secondary display device for alphanumeric data.

- An IBM 5161 Model 1 Expansion Unit.

With the exception of the keyboard, all these attachments are optional.

The IBM 3270 Personal Computer Graphics Control Program

The IBM 3270-PC Control Program (for work stations using the IBM 5151 Monochrome Display or the IBM 5272 Color Display) manages the display of up to four host applications and one local, personal computer application. Other facilities include programs to transfer data between the host and the work station, and local scratch pad areas or **notepads**.

The IBM 3270-PC **Graphics Control Program** includes all the functions of the IBM 3270-PC Control Program but adds new function to exploit the capabilities of the IBM 5279 and the IBM 5379 Displays:

- Graphics are drawn by a comprehensive set of vector graphics instructions such as:

  Line
  Arc
  Area
  Marker
  Image
  Character string

  and attributes such as color and line width. All functions can be invoked by both host and PC application programs.

  In contrast with graphics based on programmed symbol sets, such as on the IBM 3279, vector processing is carried out in the work stations rather than in the host. This reduces the workload of the host and increases the number of terminals it can support. A vector graphics data stream is usually shorter than the programmed symbols equivalent, which reduces the demands on the network and on the 3274 Control Units. A further advantage, in comparison with programmed symbols, is that vector graphics allow the production of much more complex pictures.

- The following graphics functions can be carried out:

  - Moving all or part of a picture

  - Scaling: reducing or enlarging all or part of a picture

  - Rotation: changing the orientation of all or part of a picture

- Projection: obtaining a two-dimensional view of a three-dimensional picture

- Scrolling of the picture.

● For graphics input, the control program provides **logical input devices** called **locator**, **pick**, **string**, and **stroke**. The user operates these logical devices (which are described in detail in Chapter 4) from the keyboard, the tablet, or the mouse.

● Host-interactive and personal computing applications can use the plotters attached to the work station.

● Alphanumeric and graphics data displays can be printed on the work station printers. This is achieved using a spool print facility that builds a **picture interchange format** file, and another utility that prints it.

● The programming language APL is supported for host-interactive application programs.

Host Programming Support

The IBM 5279 and the IBM 5379 work stations can use the extensive programming support available in the host computer for the IBM 3270 display system.

For graphics, the program product Graphical Data Display Manager (GDDM) Release 4 provides the following support for the work stations:

● Vector graphics.

● Graphics input.

● Plotters attached to the work stations.

● The use of picture interchange format files for the transfer of graphics data between work station and host.

● Migration, without change, of IBM 3270 application programs that use programmed symbol set graphics.

Personal Computing Programming Support

Subject to certain limitations (described in detail in Appendix B), the work stations can run programs under PC DOS 2.1 that use the IBM PC Color Graphics Adapter, in alphanumeric and graphics modes.

The IBM 3270-PC Graphics Control Program provides an interface for PC applications to access the full graphics capabilities of the work stations. This gives PC application programs the advantages of:

- Up to eight colors (5279) or sixteen colors (5379)

- Larger screen sizes

- Higher resolution.

Summary of Capability

The IBM 3270-PC/G and 3270-PC/GX work stations enable a user to:

- Manage up to four host applications, one local PC application, and up to two notepads, all in the work station concurrently. The other facilities of the IBM 3270-PC control programs, such as keystroke recording and playback, are also available.

- Use host application programs written for IBM 3270-family terminals. Base color, extended color, extended highlighting, and programmed symbol sets for user-defined fonts are all available. APL is also available.

- Use host graphics application programs that run under GDDM Release 4. These may be application programs written for the IBM 3279, or new or enhanced application programs that make use of the interactive graphics capabilities of the work stations.

- Use Release 4 of GDDM to plot directly onto plotters attached to the work stations.

- Run IBM PC application programs under PC DOS 2.1.

- Run IBM PC application programs that exploit the color, screen sizes, and graphics capabilities of the work stations.

- Create picture interchange format files, using the spool print facility of the Graphics Control Program. Print the files with the print utility of the Graphics Control Program.

- Use the file transfer facilities of the control program together with the IBM 3270-PC File Transfer program product in the host to transfer picture interchange format files between the work station and GDDM in the host. These files, too, can be printed with the print utility of the Graphics Control Program.

For Further Details...

The remainder of Part 1 of this manual amplifies this overview:

- Chapter 2 illustrates the types of application that can take advantage of the IBM 5279 and IBM 5379 Display work stations.

- Chapter 3 gives more detail on the hardware of the work stations.

- Chapter 4 describes the IBM 3270-PC Graphics Control Program.

- Chapter 5 covers programming support for the work stations, both in the host and for local computing.

Appendix A gives information about attaching to and customizing an IBM 3274 Control Unit.

Appendix B deals with the compatibility between the work stations and the 3270 family, and contains detail considerations on the use of programs written for the IBM Personal Computer.

Chapter 2. What the Work Stations Can Do for You

This chapter gives examples of the types of application you can run on a 3270-PC/G or /GX work station. The display screens illustrate typical applications; they do not show actual applications using the Graphics Control Program.

Figure 2 through Figure 6 show applications for a work station that has a 5279 Color Display. Although these applications could also be run on a work station with a 5379 Display, the 5379 is intended primarily for applications that demand a display of higher resolution and greater interactive performance. Examples of such applications are shown in Figure 7 through Figure 10.
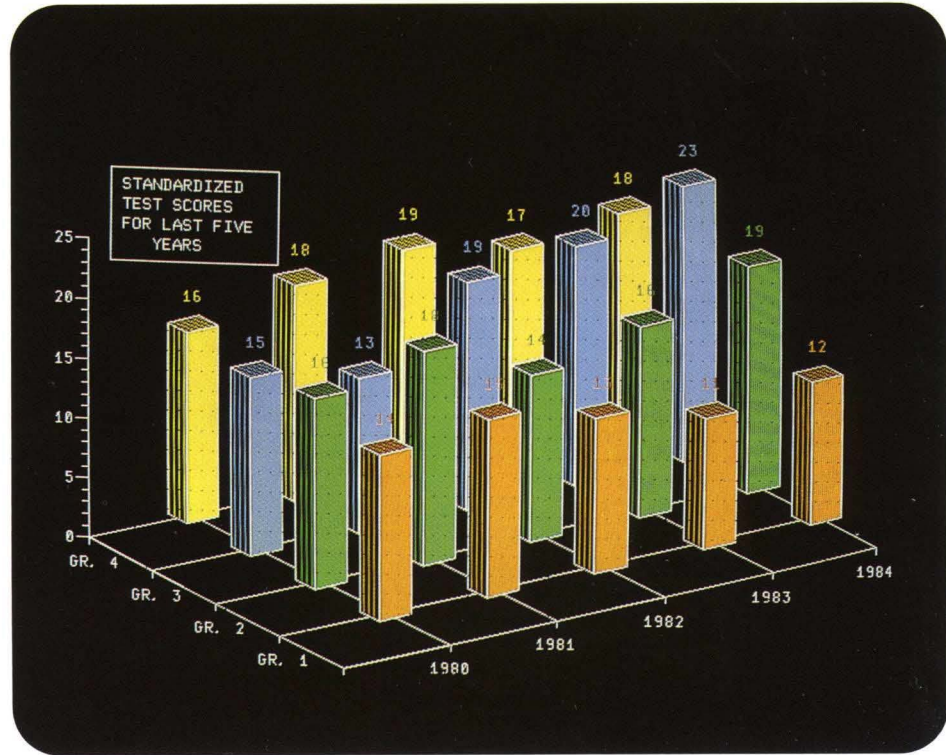
Figure 2. Tower Chart Displayed on a 5279 Screen

Figure 2 shows an example of how color graphics are often used in business presentations. Three-dimensional tower charts such as this can be produced by the Interactive Chart Utility of GDDM Release 4.
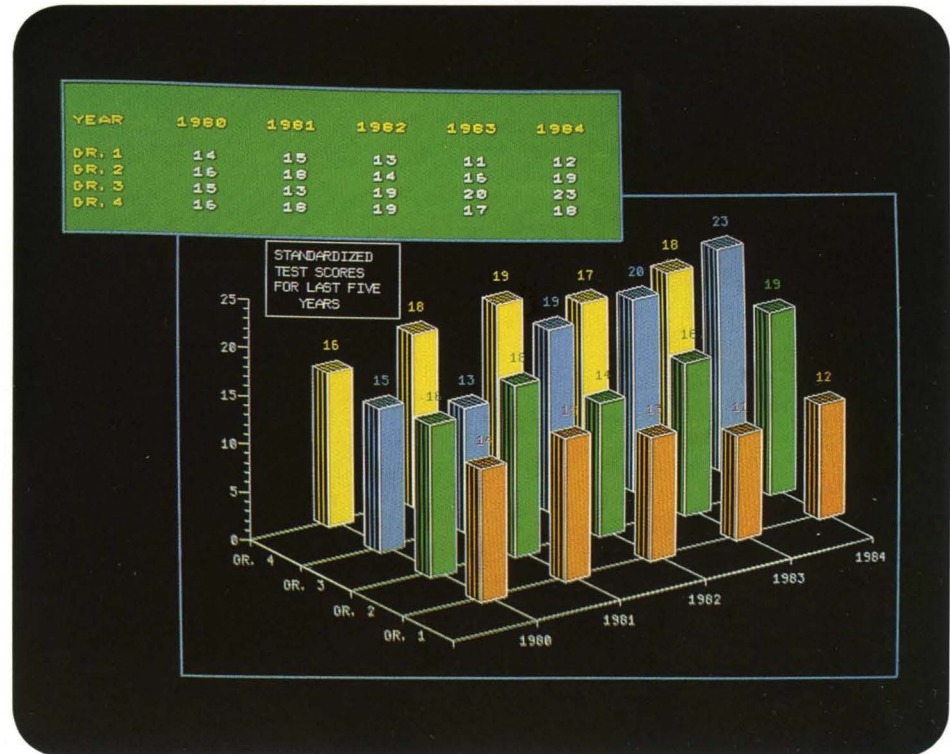
Figure 3. Multiple Applications Displayed on a 5279 Screen

The work station allows you to run several applications at the same time. Each application is displayed in its own window on the screen. You can arrange these windows on the screen (overlapping them if necessary) just as you would arrange papers on your desk.

For example, if you were constructing a tower chart, you might want to review the data from which the chart was constructed. Figure 3 shows how you might do this. Two applications are displayed on a 5279 screen together. One is displaying the tower chart, the other is displaying the data.
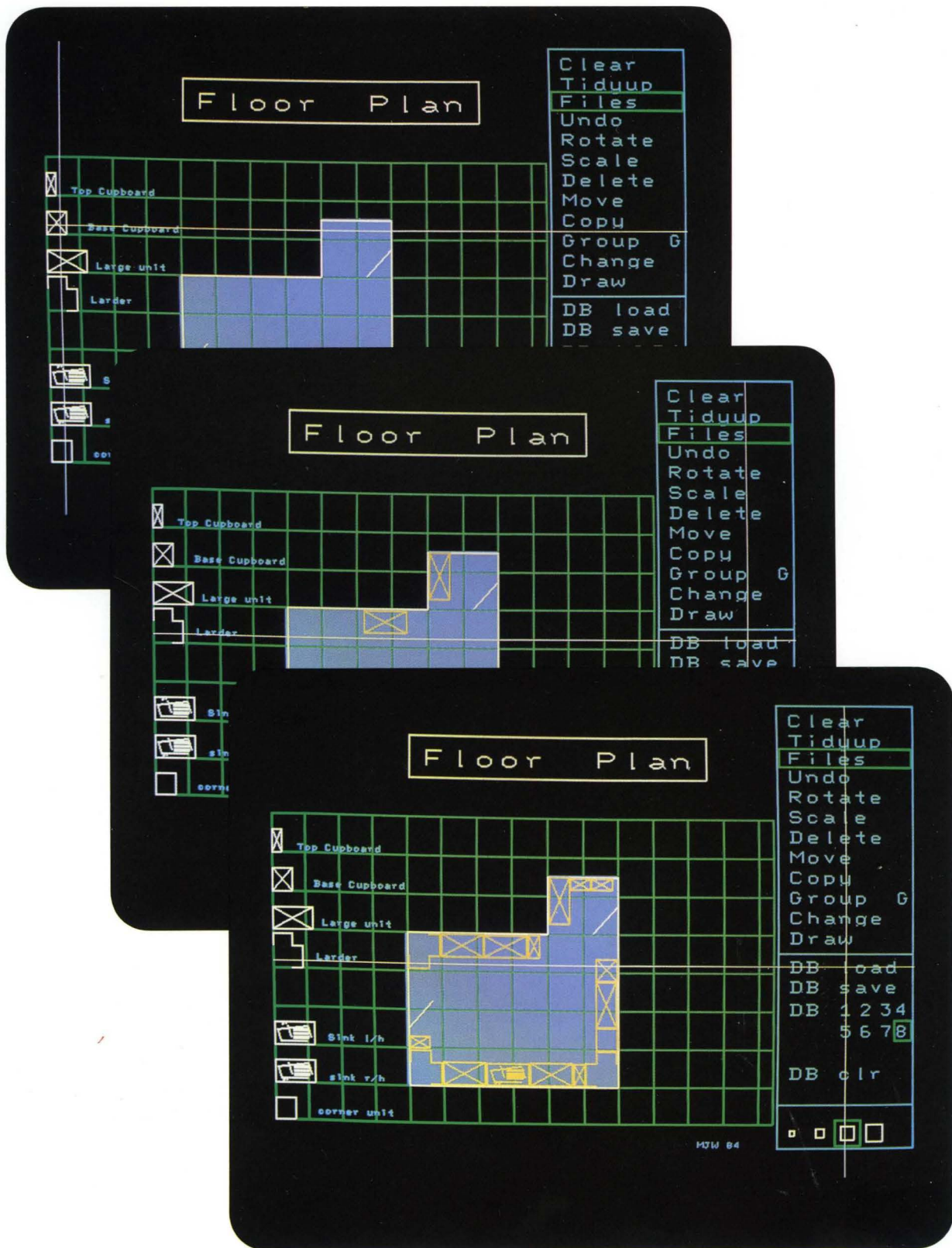
Figure 4. Floor Plan Being Created on a 5279 Screen

An important difference between the 3270-PC work stations and the 3279 is that on the work stations you can interact directly with the picture displayed on the screen. For example, you might want to assemble a picture from a collection of symbols that have been created previously. By displaying that collection as a menu, you can select the symbols that you wish to include in your final composite picture, copy them into the active window, and position them as required.

Figure 4 shows three sequential views of a kitchen layout being constructed on the screen. In the first view, a menu of items of kitchen furniture is displayed down the left-hand side of the screen. In the second view, items have been selected and moved to their required positions on the screen. In the final view, the kitchen layout is complete. The principle illustrated here can be used in many layout and organizational applications.
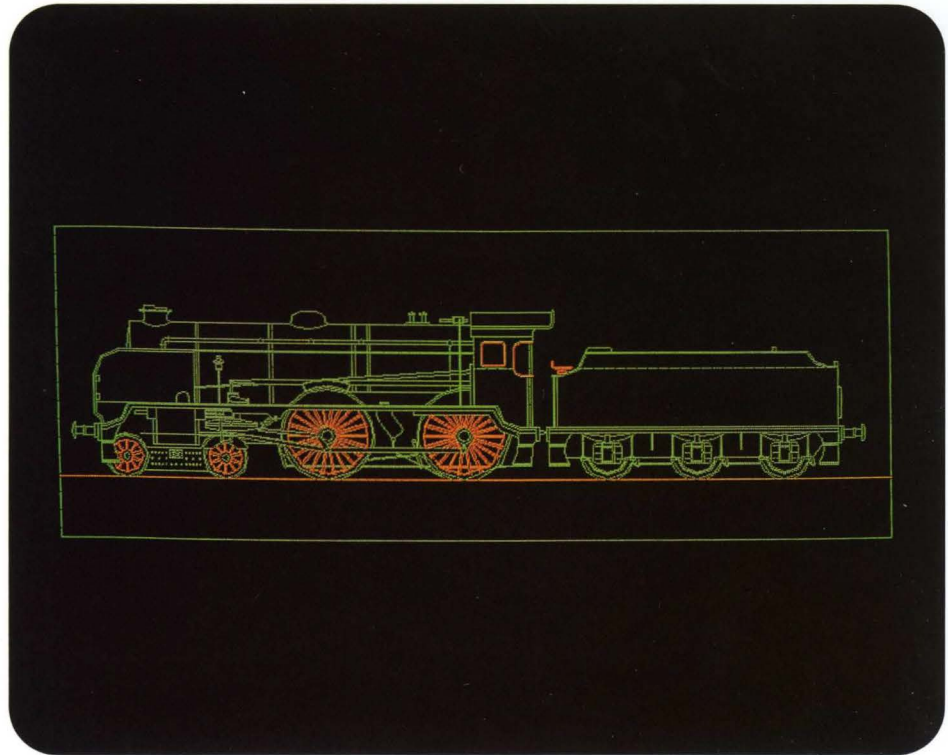
Figure 5. Steam Locomotive on a 5279 screen
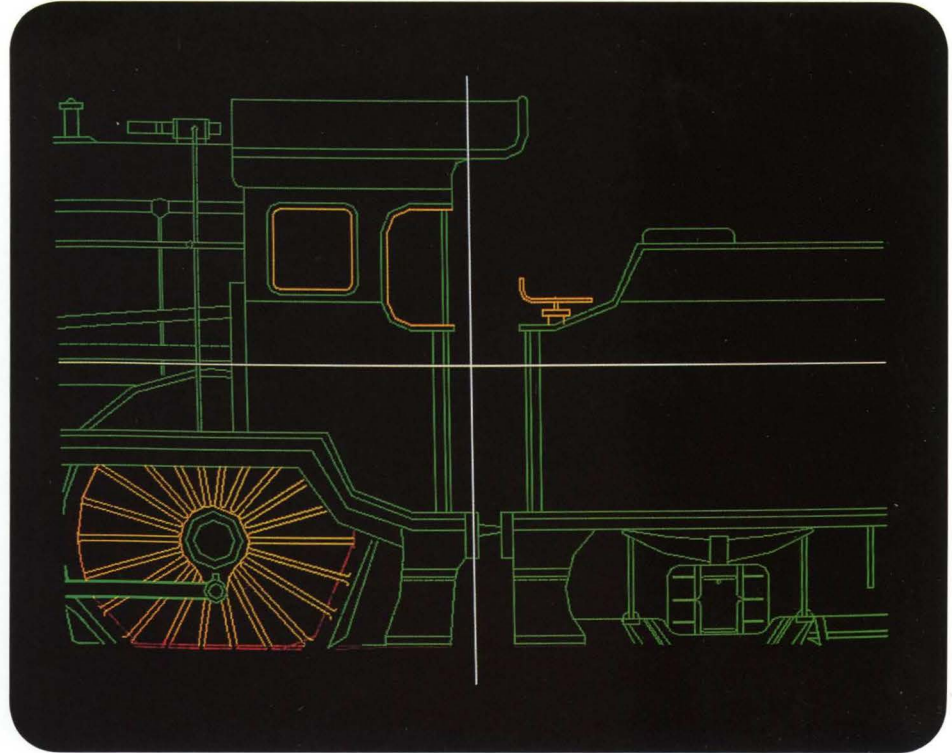
Figure 6. Enlargement of Part of the Steam Locomotive

Both the 3270-PC/G and /GX work stations provide the graphics function that allows you to move around and scale parts of graphics pictures. Figure 5 shows a drawing of a steam locomotive displayed on a 5279 display. Figure 6 shows an enlargement of the cab of the locomotive.

The 5279 is ideal for displaying pictures from engineering data bases for general review. For more complex pictures, such as the diesel engine shown in Figure 10, the higher resolution and better interactive performance of the 5379 might make it more suitable.
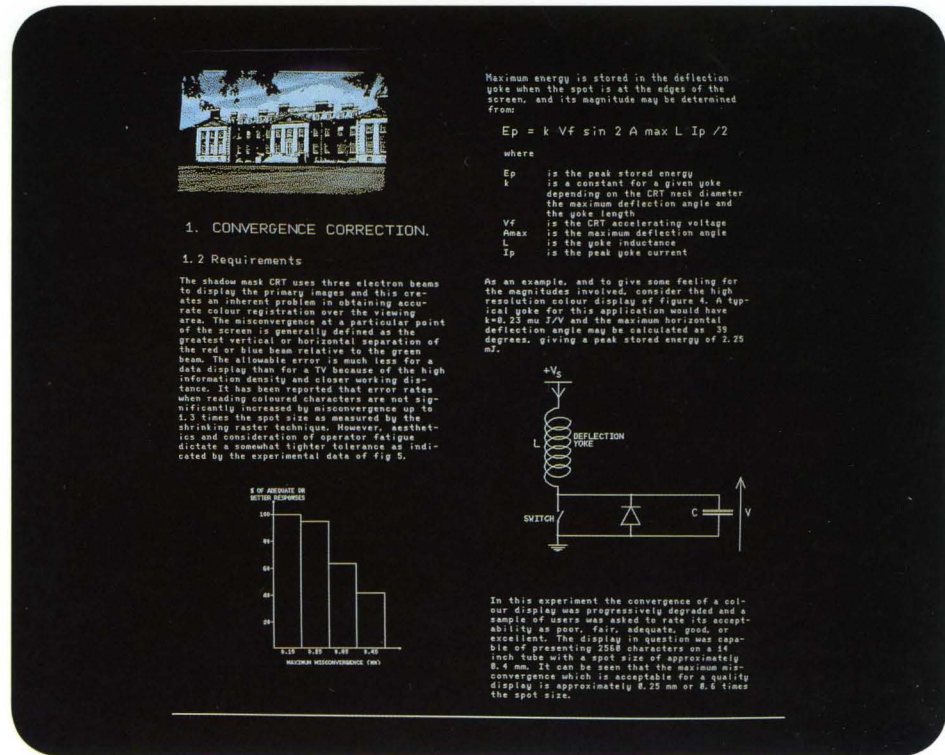
Figure 7.   Page Composition on a 5379 Screen

Figure 7 shows a page-layout application, for which the 5379 is ideal. A composition program would allow you to arrange graphics, image, and text on the screen as if you were organizing the layout for a page in a book. You can interact locally with the display to alter the sizes and positions of the various objects on the page.

For this type of application, the clear definition of the 5379 monochrome display is an advantage.
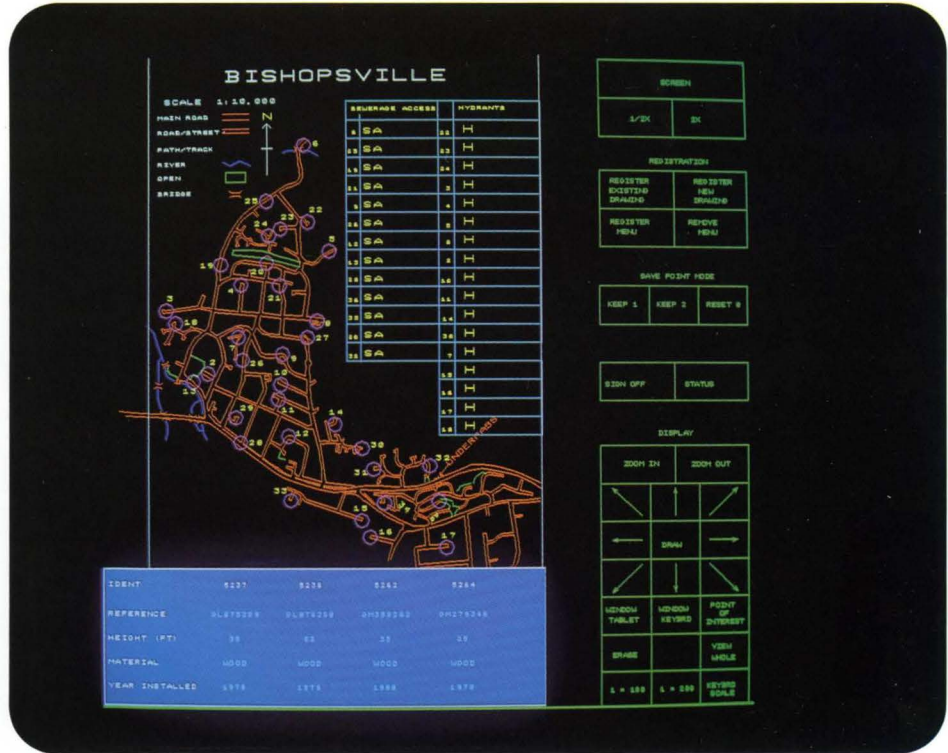
Figure 8. Map Displayed on a 5379 Screen

The performance of the 5379 makes it particularly suitable for applications in which a particular section of a picture is selected for editing. Figure 8 shows a section of a map. The menu used to select and edit the map is shown on the right hand side.

It is not unusual in this sort of application to want to refer to related figures; statistics of types of constructions, for example. The multiple applications capability of the work stations allows you to display the figures in a second window on the screen.
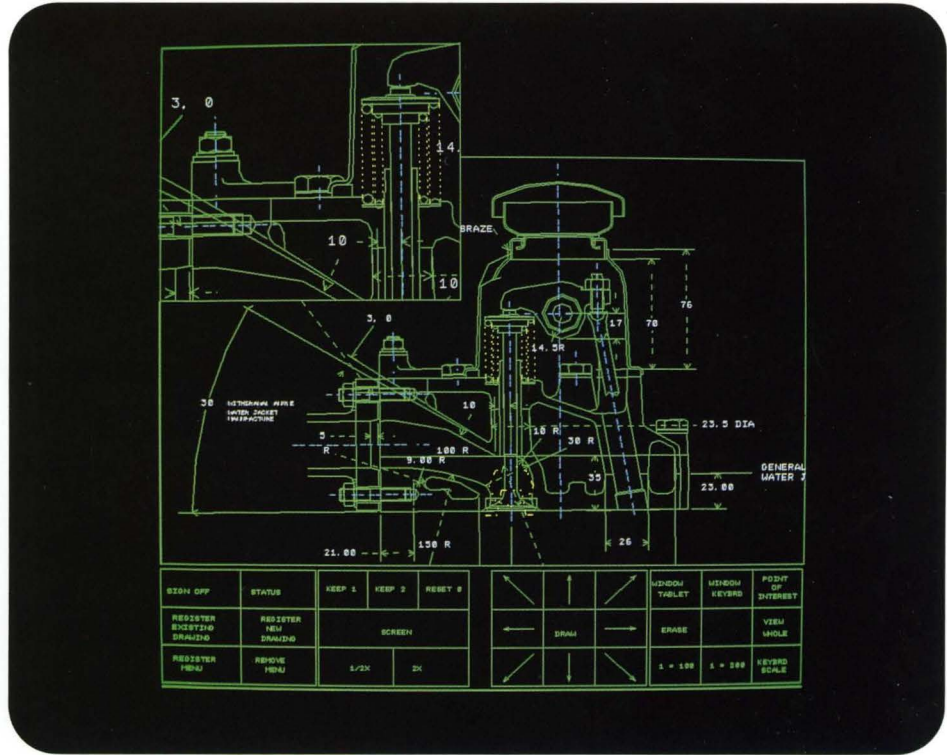
Figure 10. Engineering Drawings on a 5379 Screen

Figure 10 is an engineering drawing of a diesel engine originally produced in a CAD/CAM system. The area of particular interest has been enlarged and shown in a separate window. At the bottom of the picture is the menu used to control the application.

In this application, advantage has been taken of the larger screen size and higher resolution of the 5379 display.

Chapter 3. The Work Station Components

The IBM 3270-PC/G and 3270-PC/GX work stations offer a range of hardware elements from which you can configure a work station to suit your individual requirements. A work station consists of some or all of the following components:

- A display

- A display attachment unit

- A system unit

- A second display (3270-PC/GX only)

- Additional memory

- A keyboard

- Graphics input devices: mouse and tablet

- Output devices: printers and plotters.

Figure 11 and Figure 12 show two typical configurations.

Figure 11. Typical Configuration with a 3270-PC/G. Showing a 5279 display standing on its 5278 attachment unit, a system unit, a printer, a mouse, and a keyboard.

Figure 12. Typical Configuration with a 3270-PC/GX. Showing a 5379 display with its 5378 attachment unit, a system unit, a tablet, and a keyboard.

The **IBM 3270-PC/G** work station uses the IBM 5279 Color Display.

The **IBM 3270-PC/GX** work station offers a choice of two display units:

- IBM 5379 Display Model C01 (color)

- IBM 5379 Display Model M01 (monochrome).

All three of these display units can:

- Display traditional character data

- Operate in all-points-addressable mode for graphics data

- Emulate the PC Color Graphics Adapter.

Each display is used with a display attachment unit that provides alphanumeric and graphics functions and the buffer storage necessary for the operation of the display. Further information about the display attachment units is given later in this chapter.

IBM 5279 Color Display

Figure 13.   IBM 5279 Color Display and 5278 Display Attachment Unit

The IBM 5279 Color Display, together with its associated 5278 Display Attachment Unit, is a medium-resolution display for general graphics work such as the creation of simple pictures, pie charts, histograms, bar charts, foils, and layout diagrams. It can be used with any model of the IBM 5371 System Unit to display both alphanumeric and graphical data.

The 5279 has a 356-millimeter (14-inch) screen that can display eight colors. The screen is all-points-addressable with a 720 x 512 dot matrix and a viewable area of 240 x 181 millimeters (9.4 x 7.1 inches), providing good resolution for displayed pictures. For alphanumeric applications, the 5279 can display a maximum of 3920 characters. You can select to display either 2560 characters in 80 columns by 32 rows (normal characters), or 3920 characters in 80 columns by 49 rows (small characters).

The IBM 5278 Display Attachment Unit is the slim unit on which the 5279 display sits in the figure.

For operator comfort, the 5279 provides an antiglare screen, and adjustment for tilt and swivel. An optional height-adjustment feature is also available.

IBM 5379 Display Model C01
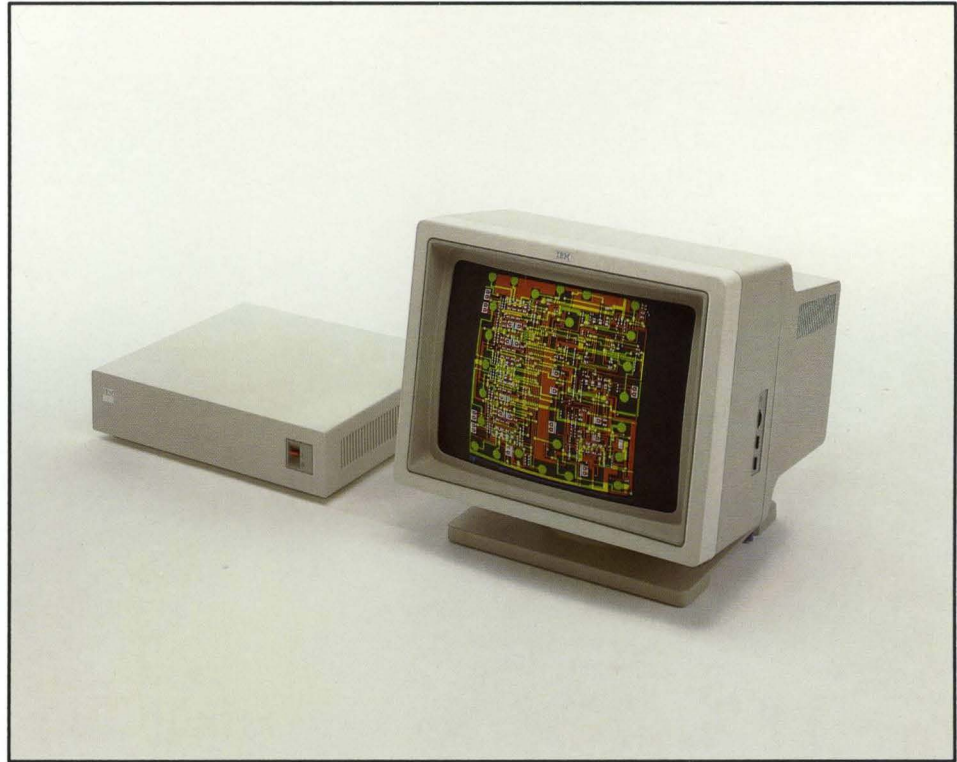
Figure 14.   IBM 5379 Display Model C01 and 5378 Display Attachment Unit

The IBM 5379 Display Model C01 together with its associated 5378 Display Attachment Unit Model C01, is a high-resolution, color display for precision graphics work where color coding offers an advantage; for example, map drawing, electronic design, and complex business graphics. It can be used with any model of the IBM 5371 System Unit to display both alphanumeric and graphical data.

Model C01 has a 483-millimeter (19-inch) color screen that can display up to a maximum of 16 colors. The screen is all-points-addressable with a 960 x 1000 dot matrix in a viewable area of 261 x 279 millimeters (10.3 x 11 inches). For alphanumeric applications, the screen can display a maximum of 4000 characters in 80 columns by 50 rows.

For operator comfort, the 5379 provides an antiglare screen, and adjustment for tilt and swivel.

IBM 5379 Display Model M01

Figure 15.   IBM 5379 Display Model M01 and 5378 Display Attachment Unit

The IBM 5379 Display Model M01, together with its associated 5378 Display Attachment Unit Model M01, is a high-resolution, monochrome display for precision graphics work and text applications; for example, engineering drawings, and page composition. It can be used with any model of the IBM 5371 System Unit to display both alphanumeric and graphical data.

Model M01 has a 483-millimeter (19-inch) monochrome screen that can display up to a maximum of four levels of intensity. The screen is all-points-addressable with a 960 x 1000 dot matrix in a viewable area of 261 x 279 millimeters (10.3 x 11 inches). For alphanumeric applications, the screen can display a maximum of 4000 characters in 80 columns by 50 rows.

For operator comfort, the 5379 provides an antiglare screen, and adjustment for tilt and swivel.

Display Attachment Units

The display attachment units are:

- IBM 5278 Display Attachment Unit, for the 5279 Color Display

- IBM 5378 Display Attachment Unit Model C01, for the 5379 Display Model C01

- IBM 5378 Display Attachment Unit Model M01, for the 5379 Display Model M01.

The 5278 and 5378 Display Attachment Units provide the alphanumeric and graphics functions and the buffer storage necessary for the operation of the all-points-addressable displays and for the emulation of the IBM PC Color Graphics Adapter.

However, the way in which both the function and the work to be done is distributed between the display attachment units and the system units is different.

In the 5278, there is hardware to assist in drawing lines and filling areas when drawing a graphics picture.

In the more powerful 5378, there is a graphics processor which handles the vector to raster conversion and performs clipping, transformation, and correlation functions. Provided with this processor is 128 kilobytes of high speed memory for the display buffers and for storing graphics vectors and character sets. Part of this memory is also accessed by the 5371 System Unit.

Both display attachment units, when used with the Graphics Control Program in the system unit, provide the same graphics function:

- Vector to raster conversion

- Picture moving, scaling, and scrolling

- Two-dimensional transforms

- Clipping

- Correlation

- Lines, polylines, and areas

- Area fill

- Arcs and fillets

- Characters (vector and image).

IBM 5371 System Unit

Figure 16. IBM 5371 System Unit

The IBM 5371 System Unit is the processor for the work station. It also handles the attachment to the host and the input/output devices. The system unit is available in three models. These models offer a choice of memory sizes, and a choice of diskette and fixed-disk configurations.

Model 12 has 384 kilobytes of memory and one 360-kilobyte diskette drive and adapter.

Model 14 has 512 kilobytes of memory and two 360-kilobyte diskette drives and adapter.

Model 16 has 512 kilobytes of memory, one 360-kilobyte diskette drive and adapter, and one 10-megabyte fixed disk and adapter.

In addition, all models have adapters for attaching to:

- Keyboard
- Display
- Printer
- Tablet or mouse
- 3274 - See Appendix A for details.

Optional Features

Subject to certain limitations, you can expand your work station by attaching any of the following optional features to the system unit. See Chapter 6 for details of valid configurations.

- **Monochrome Display Adapter and Monochrome Display**

Figure 17. Second Screen Attached to 5379 Display Station

This feature is available only for work stations that have a 5379 Display. It provides attachment for an IBM 5151 Monochrome Display Model 2, which you use to display alphanumeric data, thereby leaving the 5379 completely free to display graphical data.

- **IEEE-488 Adapter**

This feature provides an interface for the attachment of IBM 7371, 7372, 7374, or 7375 Color Plotters to your work station. You may attach devices other than these IBM plotters to this adapter provided they have the same interface characteristics, but in this case you are responsible for device control programming. You can attach up to 13 devices (IBM or non-IBM) to the IEEE-488 interface. Only one device, however, can be accessed at any one time.

Support for the IBM plotters is provided by GDDM for host-computer applications.

- **Asynchronous Communications Adapter (RS-232-C)**

  This feature provides an EIA RS-232-C interface to which you can attach non-IBM devices.

- **64/256Kb Memory Expansion Option**

  This feature provides an additional 64 kilobytes of memory.

- **64Kb Memory Module Kit**

  This feature provides further memory in increments of 64 kilobytes. See Chapter 6 for further details.

- **IBM 5161 Expansion Unit Model 1**

Figure 18.   Expansion Unit Model 1

The expansion unit provides an extension to your 5371 System Unit. It includes a 10-megabyte fixed disk. You will need this option if the system unit has no spare slots available for the installation of additional option cards. For advice on which configurations need an expansion unit, see Chapter 6.

The Keyboard

Figure 19. The Keyboard

The 122-key EBCDIC typewriter-style keyboard includes 24 Program Function keys and an 18-key numeric keypad. It provides function keys both for 3270 host operations and for IBM Personal Computer operations. To help distinguish between the two types of function, the 3270 host keys are etched in black while the keys that are unique to Personal Computer operations are etched in blue. The keyboard has a slim profile with an angle of slope that can be adjusted to the operator's preference. Included with the keyboard is an overlay that identifies the Graphics Control Program functions assigned to the program function keys.

The keyboard attaches by way of a flexible cable to the keyboard adapter card in the system unit.

An APL keyboard is also available for use with host-interactive applications. The APL symbols are marked on the keytops in orange.

Optional Devices

This section describes the optional IBM devices that you can attach to the 5371 System Unit.

IBM 5277 Mouse and Locator Pad
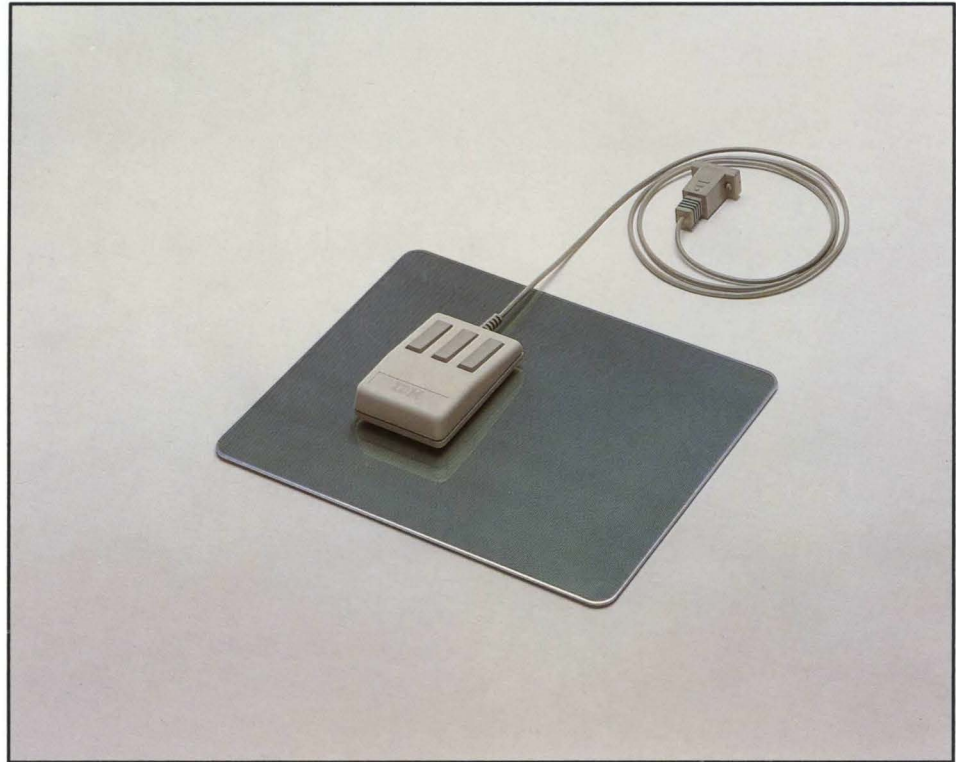
Figure 20.   IBM 5277 Mouse and Locator Pad

The IBM 5277 Mouse and its locator pad (Figure 20) enable you to position the graphics cursor on the screen without using the keyboard. When the mouse is moved across the locator pad, it senses changes in its position and sends coordinates to the work station. These coordinates are used to position the graphics cursor on the screen.

The mouse has three action keys, of which two can be assigned functions by application programming.

The mouse attaches by way of a thin, flexible cable to the keyboard adapter card of your system unit.

Note: You cannot have the mouse and the tablet (see below) attached to the system unit at the same time.

IBM 5083 Tablet Model 2, with Four-Button Cursor or Stylus
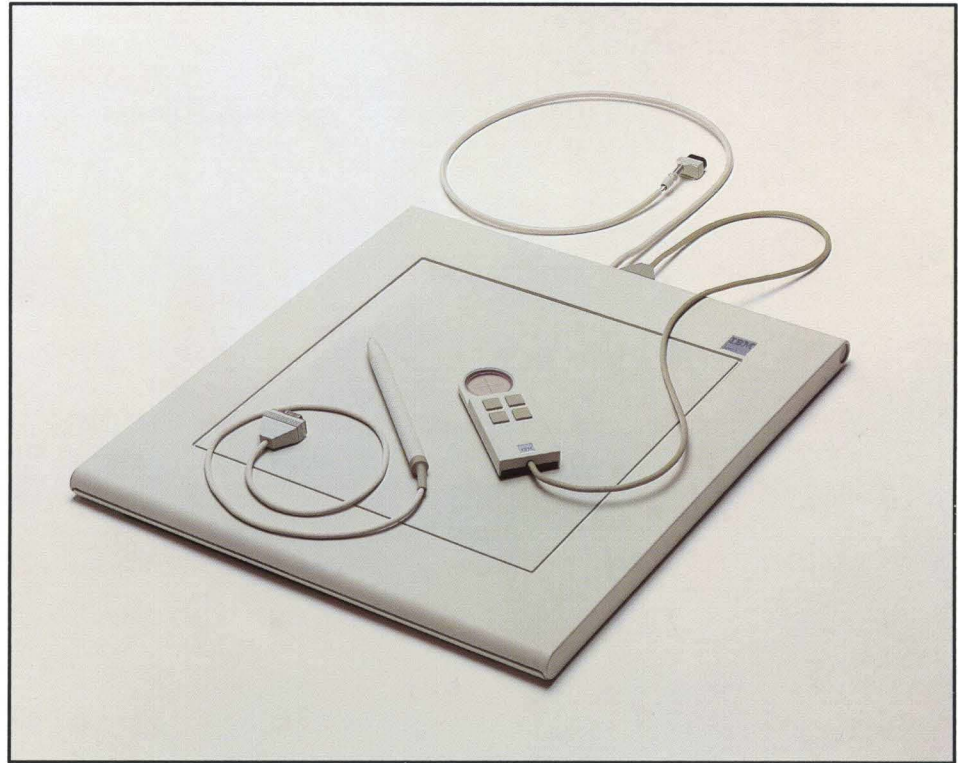
Figure 21. IBM 5083 Tablet Model 2 (Showing Four-Button Cursor and Stylus)

The IBM 5083 Tablet Model 2, with its four-button cursor or stylus attached (Figure 21), provides another method of addressing specific areas of the screen without using the keyboard. The tablet can be used only with the graphics control program.

Note: You may order both the four-button cursor and the stylus, but only one of the devices can be attached to the tablet at any one time. The choice between the two is likely to be by personal preference.

The four-button cursor is a hand-held device with a fine cross hair that enables you to position it over a precise point on the tablet. With a drawing laid on the tablet, you can use the cursor to copy that drawing onto the screen of the work station. You can also use the four-button cursor for general control of the graphics cursor, and for addressing specific areas of the screen.

The four buttons can be assigned functions by application programming.

The stylus is a pen-like device with which you can:

- Select an option from a paper menu laid on the tablet
- Copy a drawing onto the screen from an original laid on the tablet
- Draw on the tablet and produce a picture on the screen.

The stylus is especially useful for entering fine line drawings or signatures.

The tablet has an active area of 292 x 292 millimeters (11.5 x 11.5 inches). It attaches by way of a thin, flexible cable to the keyboard adapter card of the system unit.

Note: You cannot have the tablet and the mouse attached to the system unit at the same time.

Printers

You can attach the following IBM printers to the parallel printer adapter interface in the system unit:

- IBM 3852 Color Ink Jet Printer

- IBM 5182 Personal Computer Color Printer

- IBM 5152 Monochrome Printer

IBM 3852 Color Ink Jet Printer

Figure 22.   IBM 3852 Color Ink Jet Printer

This is a tabletop printer which uses ink jet technology to print graphics and text in 7 colors: yellow, magenta, cyan, black, red, green and blue.

Printing can be done on overhead projection foils. A bold mode (double density) is provided.

Characters are printed at a nominal speed of 37 characters per second with a line length of 80 characters. The maximum print line is 7.6 inches.

For graphics all-points-addressable printing using the Print Utility of the 3270-PC Graphics Control Program the horizontal and vertical resolutions are 84 pels per inch and the maximum print line is 640 pels.

IBM 5182 Personal Computer Color Printer

Figure 23.   IBM 5182 Personal Computer Color Printer

This is a tabletop printer which uses a wire matrix impact print technology to print graphics and text in any of the following three programmable states:

- All black

- 4-color (red, green, blue, black)

- 8-color (yellow, magenta, cyan, black, orange, green, violet, brown).

For character printing it provides a range of speeds depending on the print quality desired: 200 cps draft, 110 cps text or correspondence, 35 cps near-letter-quality. The maximum print line is 132 characters. The maximum print line is 13.5 inches.

For graphics all-points-addressable printing using the Print Utility of the 3270-PC Graphics Control Program the horizontal and vertical resolutions are 84 pels per inch and the maximum print line is 1108 pels.

IBM 5152 Monochrome Printer
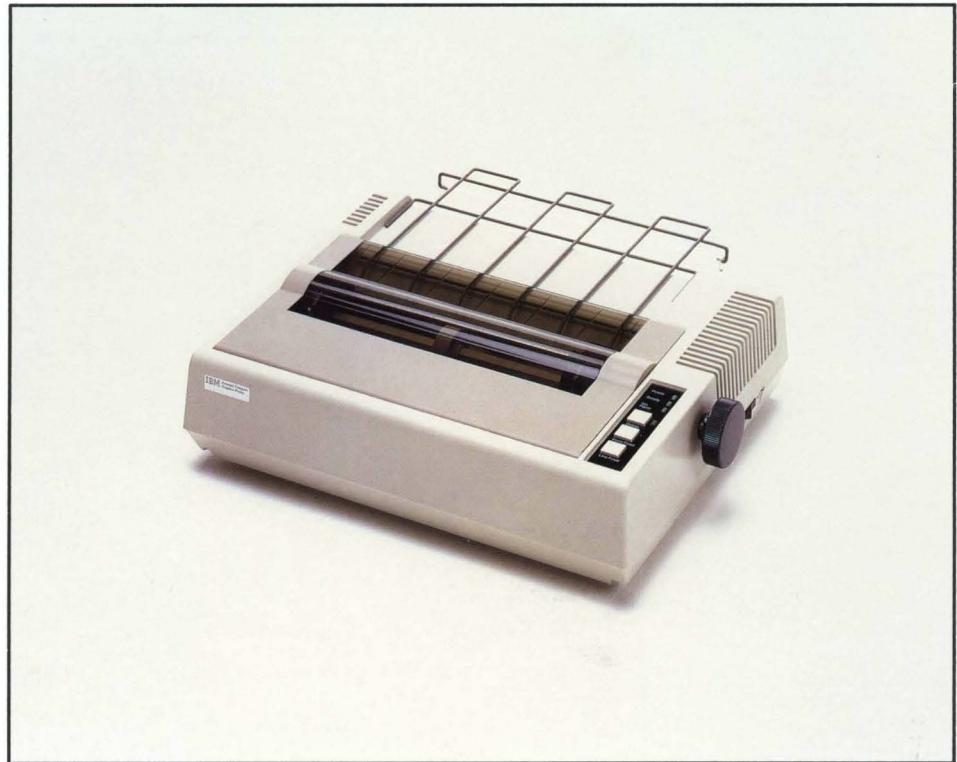
Figure 24.   IBM 5152 Monochrome Printer

This is a tabletop monochrome printer which uses a wire matrix impact print technology to print graphics and text.

For character printing it provides a programmable range of print sizes and of characters per line with a nominal speed of 80 cps for an 80 character line. 132 characters per line can be printed using a condensed option. The maximum print line is 8 inches.

For graphics all-points-addressable printing using the Print Utility of the 3270-PC Graphics Control Program the horizontal resolution is 120 pels per inch and the vertical is 72 pels per inch. The maximum print line is 960 pels.

Plotters

You can attach the following IBM plotters to the optional IEEE-488 interface in the system unit:

- IBM 7371 Color Plotter

- IBM 7372 Color Plotter

- IBM 7374 Color Plotter

- IBM 7375 Color Plotter.
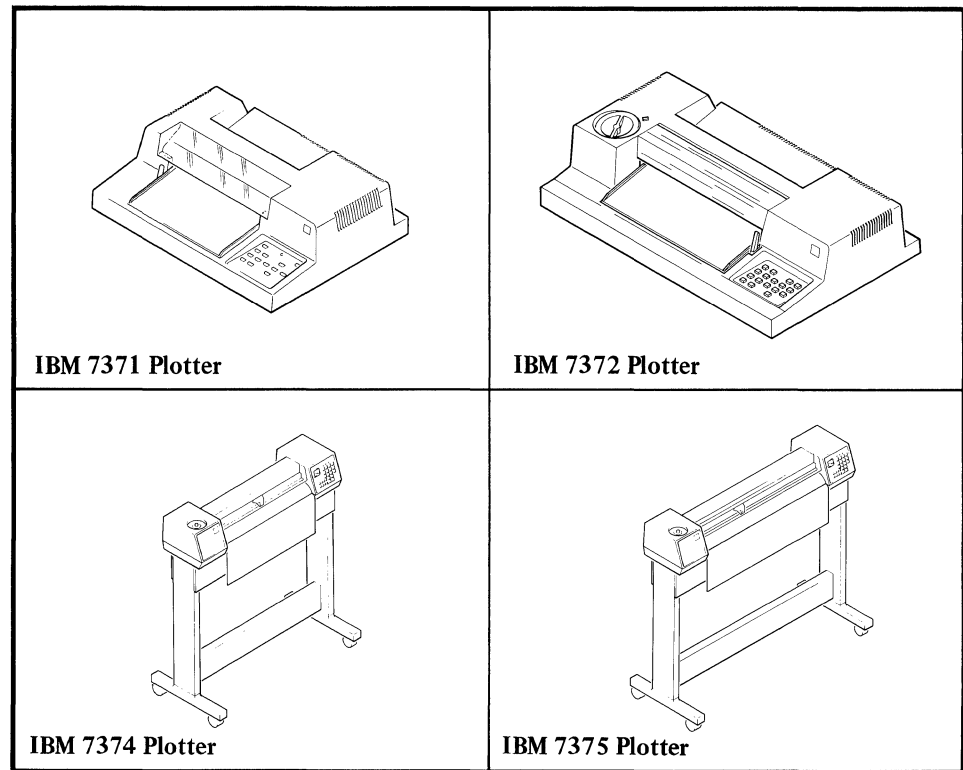
Figure 25. IBM Plotters

Figure 26 summarizes the characteristics of the plotters.

Plotter	Type	Pens	Paper Size
7371	Tabletop	2	215 x 279 mm (8.5 x 11 in)
7372	Tabletop	6	279 x 431 mm (11 x 17 in)
7374	Free-Standing	8	622 x 1231 mm (24.5 x 48.5 in)
7375	Free-Standing	8	927 x 1231 mm (36.5 x 48.5 in)

Figure 26. Plotter Characteristics

For further information, see the publications for the plotters.

Chapter 4. The Graphics Control Program

This chapter is intended to enable data processing professionals to evaluate the function offered by the Graphics Control Program running in the work stations.

To appreciate fully the flexibility the system offers, it is necessary to examine not only the Graphics Control Program, but its relationship with the rest of the system.

The IBM 3270-PC Graphics Control Program is an extended version of the IBM 3270-PC Control Program, for use with the IBM 5279 and 5379 Displays. The Graphics Control program provides:

- All the function provided by the 3270-PC Control Program, such as the ability to manage multiple sessions concurrently.

- Graphics capability on the four host-interactive sessions and the PC session. This graphics capability includes support for graphics input devices.

- A spool print facility that creates a graphics **picture interchange format** file for subsequent printing by a utility of the control program or for processing by other suitable application programs.

- Support for plotters attached to the work stations. A plotter can be used either directly by a host application program or by a local PC application program.

- Support for the programming language APL in alphanumeric host application programs.

- Support for attachment to a host computer through a 3274 Control Unit, with the alternative ability to use the IBM 5279 and IBM 5379 Displays as stand-alone work stations.

The following sections deal with these topics.

3270-PC Functions

The Graphics Control Program, like the 3270-PC Control Program, provides the operating environment and facilities of a professional work station:

- Up to seven concurrent activities are possible: four 3270 host-interactive sessions, two local notepad sessions, and a single IBM PC DOS session.

- Base or extended color, extended highlighting, and storage for programmed symbol sets that host application programs can use for special characters.

- Advanced screen management that allows **windows** to be defined on the display screen for each session. A window can reveal all or a defined part of each session, and can have any size and position, up to full-screen size. A window can also be given any color that the user chooses. It can be enlarged or hidden, and the session it reveals can be **scrolled** behind the window.

- The ability to copy a block of alphanumeric data within or between sessions, except for the IBM PC DOS session.

- A keystroke record-and-playback function that enables the user to record frequently used keystroke sequences for subsequent playback.

- The ability to save and restore the current work station and control program environment (for example, the screen layout definitions, any keystroke recordings, and the contents of notepads).

- The ability to print the alphanumeric contents of a host-session on a printer attached to the 3274 Control Unit.

- A file transfer facility that, in association with the IBM 3270-PC File Transfer program products, allows data in ASCII, EBCDIC, or binary format to be exchanged between work station and host.

Graphics Capability

The Graphics Control Program provides interactive graphics functions that can be used by both host-interactive and local PC application programs. The following sections of this manual describe various aspects of these functions:

- Vector graphics

- Graphics input

- How graphics function is distributed in the system

- The relationship between alphanumerics and graphics.

Vector Graphics

A user's application program produces pictures by constructing **drawing orders** that are processed by the Graphics Control Program. Drawing orders can take various forms, including:

- Graphics primitives, such as **line**, **arc**, **fillet**, **area**, **marker**, **image**, and **character string**. These are the elements that make up the picture.

- Attributes, such as line type, line width, color, area fill pattern, and character font and cell size.

- Drawing controls, which specify operations that are to be performed on a picture or part of a picture. Drawing controls enable the application program to perform such operations as:

  - Moving all or part of a picture without changing its orientation.

  - Scaling: reducing or enlarging all or part of a picture.

  - Rotation: changing the orientation of all or part of a picture.

  - Projection: obtaining a selected two-dimensional view of a three-dimensional object.

  - Scrolling the picture.

Pictures created using the Graphics Control Program consist of one or more **segments**. Usually, the segments required to display a picture are held in a segment store in the work station. Both host and local application programs have access to the segments in the store. The picture can be redrawn without retransmitting all the picture segments from the host. Only those segments that have been changed need to be retransmitted. But some pictures are too complex to be held in the memory available to a session. Such pictures can be drawn in **unretained mode**. When pictures are displayed in unretained mode, each successive picture segment is drawn on the screen and then discarded. Of course, the picture itself remains on the screen in its entirety.

Graphics displays can contain character string elements. Two types of symbol set can be used in graphics displays:

- Image character sets, in which each character is defined in the form of a dot matrix, and cannot be scaled or rotated.

- Vector character sets, in which each character is defined as a series of strokes, and which can therefore appear in any size or alignment.

The control program provides standard character sets of each type, in addition to the standard alphanumeric character sets. Application programs can also define and load their own symbol sets.

Graphics Input

Chapter 3 describes the IBM 5277 Mouse and the IBM 5083 Tablet, two graphics input devices that can be used with the Graphics Control Program. They enable the user to interact directly with pictures on the work station display screen. The work station keyboard can also be used for direct interaction with the displayed picture.

These hardware input devices can operate in various modes. The modes are sometimes known as **logical input devices**. Examples of these devices are:

Locators   A locator enables the user to identify a precise position on the screen. When the user moves the mouse on its pad, the cursor or stylus on the tablet, or uses the keyboard cursor control keys, the movement is **echoed** on the display screen by a cross-hair cursor (or other shape defined by the user). When the user **selects** the position (for example, by pressing the select button on the mouse), the coordinates of the selected position are returned to the application program.

Echoes can have forms other than a cursor. The end of a line can be moved around to echo movement on the input device (**rubber lines**), or the shape of a box can be changed to echo movement on the input device (**rubber boxes**). Rubber lines and rubber boxes enable the user to change the position or shape of elements of a picture dynamically.

Picks   A pick usually takes the form of a rectangular box whose size is defined by the user, and which can be moved around the display screen in the same way as a locator. The difference is in what happens after the user selects a position indicated by the pick box. Selecting a pick position causes the name of the picture segment in which the pick lies to be returned to the application program. The coordinates of the center of the pick box are also returned.

Strokes   Strokes are similar to locators, but they allow the user to identify a whole series of points. As the mouse or stylus is moved around, its position is echoed on the screen. How often its position is returned to the application program depends on options chosen by the user. A position can be returned at a set interval of either time or distance moved, or it can be returned each time the user selects.

Strings   The user can type in a character string and edit it from the keyboard. It is echoed on the screen in the standard display character set. The whole of the string is sent to the application program when a function key is used.

How Graphics Function Is Distributed in the System

Figure 27 shows the way in which graphics function is distributed between GDDM, application programs in the host, the 3270-PC Graphics Control Program, and local PC application programs.
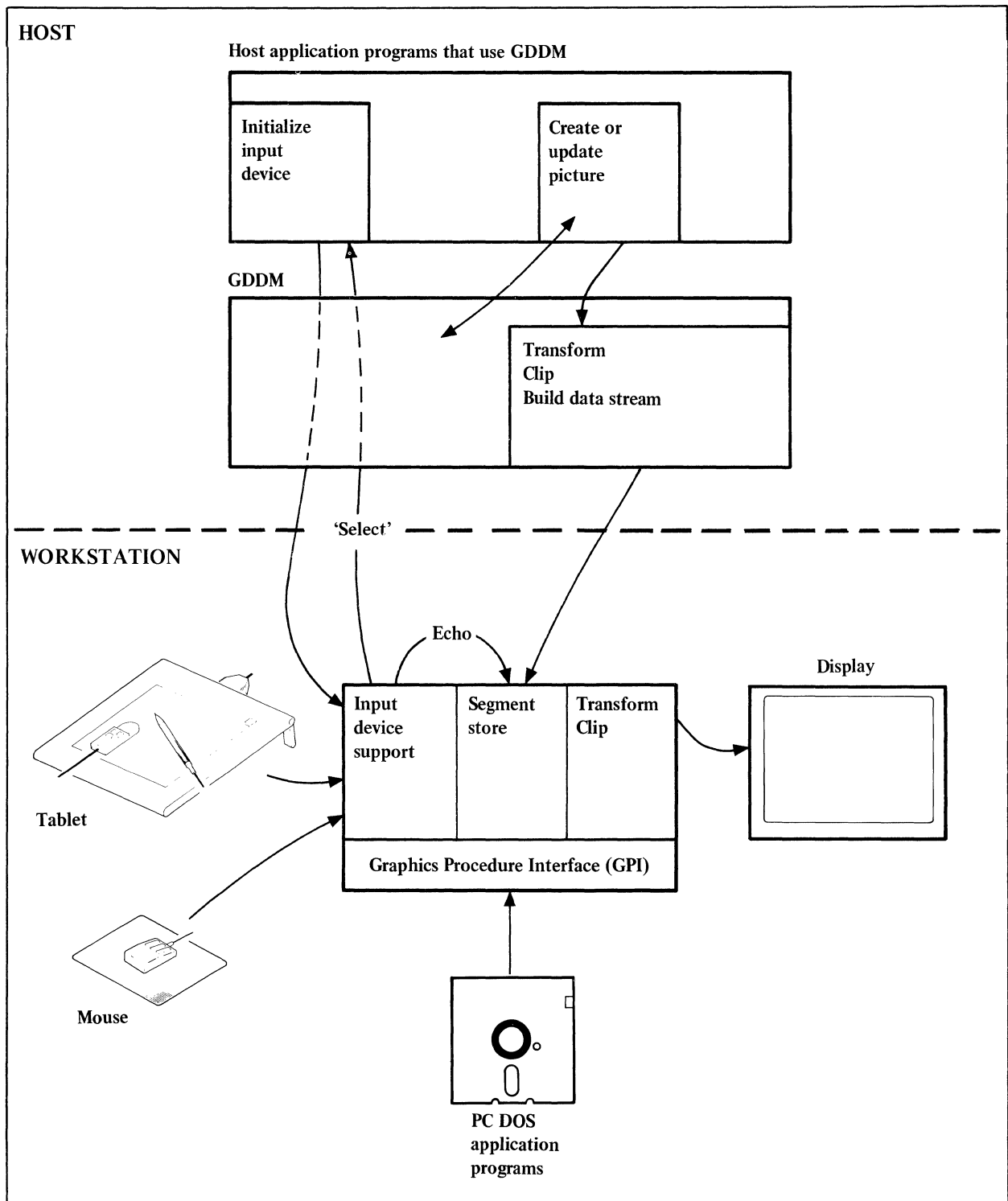
Figure 27. Distribution of Graphics Function

Creating a Picture with a Host Application Program

A host application program uses GDDM to create a picture. GDDM clips and transforms it to match the **presentation space** in the terminal, and sends the picture segments to the work station in the form of structured fields within the 3270 data stream.

The Graphics Control Program puts the picture segments in the session's segment store. The picture is then further clipped and transformed in the work station to match the window in which it is to be displayed. Finally, the picture is drawn on the screen using the display unit's vector-to-raster conversion logic.

Updating a Picture with a Host Application Program

Using GDDM, a host application program can update the picture by adding, changing, or deleting segments. Subsequently, only the changed segments need to be retransmitted to the work station. There is no need to retransmit the entire picture.

Creating or Updating a Picture with a Local Application Program

Local, PC DOS application programs have their own interface, the Graphics Procedure Interface (GPI), which gives the PC DOS application program access to the full graphics function of the work station. The application program uses this interface to create picture segments and to issue the commands that will draw the picture. The local application program can subsequently update the stored picture segment by segment.

Graphics Input for Host Application Programs

To use a logical input device such as a locator, a host application program sends the work station the control data that is needed to initialize the logical device:

- What type of logical device is it?

- What type of hardware device will be used to control the logical device?

- In what form is input to be echoed on the screen?

Now, as the operator moves, say, the mouse, the Graphics Control Program uses the data to echo the movement on the screen. The host processor is not involved and the vectors that describe the picture on the screen are not at this stage changed.

When the operator completes the move by **selecting**, the appropriate data is returned to the host, where the application program can update the picture and retransmit segments that have changed.

Graphics Input for Local Application Programs

For PC DOS application programs, the GPI makes the connection between the real device such as the mouse and the application program, and controls the way movement is sampled. However, echoing of the movement on the screen is a function of the local application program.

The Relationship Between Alphanumerics and Graphics

The IBM 5279 and 5379 work stations can handle both alphanumeric (or character) data and **all-points-addressable** data. These two types of data can both be displayed at the same time, the alphanumeric data effectively lying on top of the graphics data. Any alphanumeric data is always visible, and it is possible to control for each alphanumeric character whether its background is opaque or transparent, so that any graphics data beneath can be seen.

This function allows host application programs to combine the performance and convenience of 3270 data stream alphanumerics with the flexibility of graphics within the same picture.

A host application program can write character strings in either the alphanumeric layer or the graphics layer. In alphanumeric mode, the characters appear in fixed cell positions, with all the field formatting capabilities of the IBM 3270 system. In graphics mode, the characters can be positioned on any pel, using either image or vector character sets (as described earlier, in the section "Vector Graphics" on page 41). Users can also define their own characters in both layers.

Printing Support

The IBM 5279 and 5379 work stations offer a variety of ways to print display data from application programs.

Using a Printer Attached to the 3274 Control Unit

The 3270 system facility for sending the contents of a host application program's presentation space to a printer attached to the 3274 Control Unit continues to be available, so users who currently operate in this way can continue to do so if they wish. Printing can be initiated by the operator or by the application program. Only alphanumeric data can be printed in this way.

Direct Printing of PC DOS Application Programs

PC DOS application programs in the work station can use a directly attached PC printer in the same way as previously, except that the DOS Spool facility is not supported. The Print key causes the presentation space of an application program that is using the emulated Color Graphics Adapter to be printed immediately.

The Spool Print Facility of the Graphics Control Program

The Graphics Control Program provides a spool print facility that enables users to create a print file for subsequent printing. The Graphics Control Program also provides a utility for printing it. This utility runs as a PC DOS application program. The main features of this process are:

- Print files are created by pressing the Print key at the work station while in work station control mode.

- The print file that is created (on disk or diskette) is a graphics **picture interchange format** file. Alphanumeric data in the picture being printed is treated as graphics character strings.

- A print file can be created for a host application program, a PC DOS application program that is using the graphics procedure interface, or for a notepad. A print file can also be a **snapshot** copy of the current work station display, with multiple applications and the boundaries between them, but in this case only the alphanumeric data on the screen is sent to the print file.

- The PC DOS print utility can be invoked by the operator to print the file at any convenient time. Host sessions can still run while printing is in progress.

- Options of the print utility allow it to be invoked to print all print files or just a named one. If the utility is already running when a new print file is created, printing of the new file can start automatically.

- Because the print file is in picture interchange format, it can be saved, sent by file transfer to the host, or processed by other PC DOS application programs.

The various printing facilities described above are summarized in Figure 28.
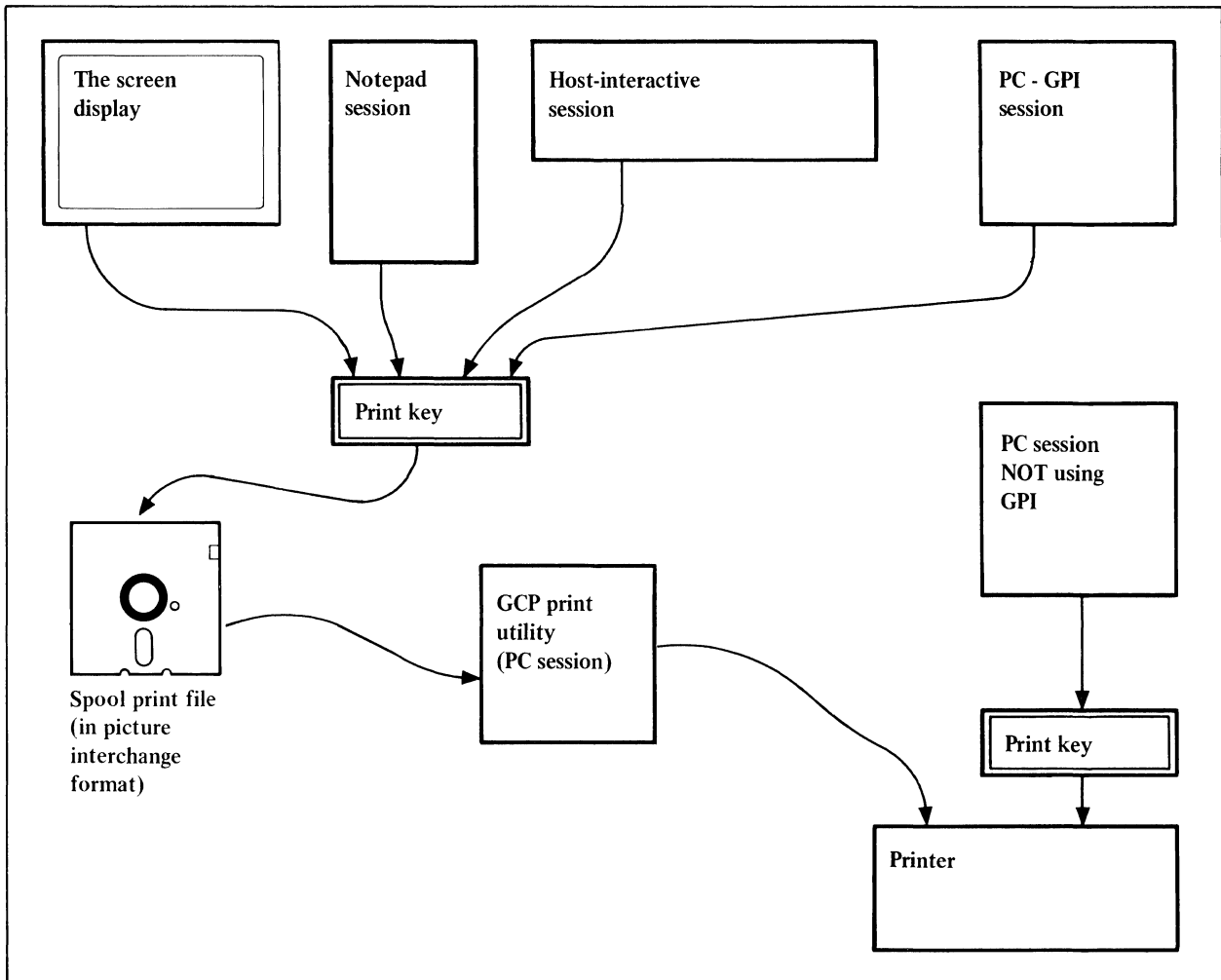
Figure 28. Overview of Printing Facilities

Plotter Support

The Graphics Control Program allows IBM 7371, 7372, 7374, and 7375 Color Plotters to be attached to the work stations through the IEEE-488 Adapter. The graphics control program manages their use for both host and local application programs. Only one plotter can be in use at a time.

The control program receives plotter orders sent by a host application program and passes them to the plotter.

PC DOS applications can use the graphics procedure interface to pass data to a plotter.

Dual Screen Operation with an IBM 5379 Display

An IBM 5379 work station can be equipped with an IBM 5151 Monochrome Display as a secondary display device for alphanumeric data, leaving the 5379 free for graphics data. This **dual screen mode** can be used for any one or more of the four possible host sessions.

IBM 5379 Monochrome Support

When the monochrome model of the IBM 5379 is used, colors are translated to four levels of gray scale (three tones, and **off**).

APL

The programming language APL can be used in application programs that are to run as host applications of the 5279 and 5379 work stations and the Graphics Control Program. An APL keyboard is available for use with the work stations. However, APL character strings cannot be handled in graphics mode and are not printed by the spool print function.

Attachment to the IBM 3274 Control Unit

Work stations attached to an IBM 3274 Control Unit can operate in one of two different modes: **distributed function terminal mode** and **control unit terminal** mode.

Distributed Function Terminal Mode

Distributed function terminal (DFT) mode is the normal method of operation for host-interactive sessions. It gives the work station the full range of function described in this chapter.

Control Unit Terminal Mode

Control unit terminal (CUT) mode is intended primarily to give the work stations access to some particular control unit functions. Some users may also use CUT mode as a method of attachment to their backup models of the 3274 that do not allow DFT attachment. In CUT mode, a work station is limited to a single host session with only base 3270 function; graphics and local PC application programs are not supported.

Attachment of the 3274 to the Host

> An IBM 3274 Control Unit can be attached to the host through a network using either SDLC or BSC protocols, or directly by a channel. For further details of 3274 attachment, see Appendix A.

Stand-Alone Operation

> The Graphics Control Program also allows a 5279 or 5379 work station to be used in a stand-alone mode, unconnected to a host. This mode of operating provides a single PC DOS session with the advantages of the work station's graphics functions and full screen utilization. Stand-alone mode is intended for occasional use, such as when manipulating a large locally-stored picture, or running a large PC application program.

Customizing the Work Station

> Individual users will have their own unique requirements for their work stations. Therefore the graphics control program provides a utility that leads users through a set of menus to customize and record the systems that they require. The choices that the user can make include:
>
> 1. The number of host sessions required, and whether each one is to have graphics capability as well as alphanumerics.
>
> 2. The number of alphanumeric notepads required.
>
> 3. Whether a PC DOS session is required, and if so, whether it is to use the graphics function through the graphics procedure interface.
>
> 4. Whether local printing or plotting is required.
>
> 5. Whether the keystroke recording and playback facility is required.
>
> 6. If the work station uses the 5279 Display, whether it will use the default character size on a 80 x 32 character screen or the smaller size on a 80 x 49 screen.
>
> 7. If the work station uses a 5379 Display with a 5151 Monochrome Display as a second monitor, whether the sessions will use dual-screen mode.
>
> Some users may like to define more than one system.
>
> An important part of the customization process is the calculation of memory requirements. The amounts required for the various options are given in Appendix E. There are different tables for the IBM 5279 and the IBM 5379 because of the different ways in which their graphics function and picture storage are arranged.

Chapter 5. The Software Environment

This chapter provides information about the software environments in which the work stations operate.

Host Software Environments

The 3270-PC/G and /GX work stations operate in the same host software environments as terminals in the IBM 3270 Information Display System. Details are given in the manual, *An Introduction to the IBM 3270 Information Display System*. The following operating systems, access methods, and subsystems support the work stations working with GDDM Release 4.

Operating Systems

- Virtual Storage Extended/Advanced Functions (VSE/AF)

- Multiple Virtual Storage/Extended Architecture (MVS/XA)

- Multiple Virtual Storage/System Product (MVS/SP)

- Virtual Machine/System Product (VM/SP).

Telecommunications Access Methods

- Advanced Communications Function/Virtual Telecommunications Access Method (ACF/VTAM) under DOS/VS, VSE/AF, and OS/VS

- Basic Telecommunications Access Method (BTAM) under OS, DOS, OS/VS, and DOS/VS

- Basic Telecommunications Access Method-Extended Support (BTAM-ES) under VSE/AF

- Virtual Telecommunications Access Method (VTAM) under DOS/VS and OS/VS.

Data Base Data Communication Systems

- Customer Information Control System/VS (CICS/VS)

- DB/DC Data Dictionary

- Information Management System/VS Data Communications (IMS/VS-DC).

Interactive Programming Support

- Conversational Monitor System (CMS)

- Interactive System Productivity Facility (ISPF)

- Time Sharing Option (TSO)

- TSO Extensions (TSO/E).

Program Products for Host Interactive Graphics Applications

Two IBM program products in particular provide support for host-interactive applications using graphics and the work stations:

- IBM Graphical Data Display Manager (GDDM) Release 4

- IBM 3270-PC File Transfer.

GDDM

GDDM is a program product whose main function is to handle the communication between application programs and terminals, particularly if the terminals are being used to display graphics. It consists of a set of routines that can be called from application programs, and some ready-made applications, or utilities.

GDDM provides:

- The Interactive Chart Utility (ICU), a stand-alone, menu-based utility for drawing charts.

- A general-purpose alphanumeric and graphics application program interface (API).

- A high-level API for drawing graphic charts and passing control to the ICU.

- Two symbol editors for producing symbols such as company logos, scientific symbols, and fonts.

- Interactive Map Definition (IMD), an interactive utility for designing alphanumeric screen and printer layouts (**maps**). These maps are used in conjunction with application programs.

Release 4 of GDDM provides the following support for graphics applications in the work stations:

- Segment transformations.

  Segments can be moved, scaled, and rotated.

- Support for graphics logical input devices:

     Locators

     Picks

     Strokes

     Strings.

- Plotters attached to the work stations.

- Picture interchange format files can be exchanged between GDDM in the host and application programs running in the work stations.

GDDM is supported on these major IBM software subsystems:

     CICS/OS/VS, CICS/DOS/VS, IMS/VS, MVS/TSO, MVS/Batch, VM/SP, and VS APL.

The General Information manual for GDDM Release 4 describes in detail the operating systems and access methods that are necessary to support GDDM.

3270-PC File Transfer

To carry out the file transfer process described earlier, you need one of the IBM 3270-PC File Transfer program products in your host system. The File Transfer program is available in different versions for the following systems or subsystems:

     VM/SP 2.1, program number 5664-281

     MVS/TSO, program number 5665-311

     CICS, program number 5798-DQH.

To transfer files between the work station and the host, you must have both a PC DOS session and a host session active in the work station. Neither of these sessions can have any other program running in them at the time that you carry out file transfer. File transfer can take place in either direction: work station to host, or host to work station. In both cases, the transfer is initiated from the PC DOS session in the work station.

Host Software Compatibility

Under GDDM Release 4, most existing 3270 alphanumeric and graphics programs (including those written for GDDM Release 3 or earlier) can be used at the work station without modification, provided that any required hardware functions are available on the work station. If you intend running programs that have been written for the 3278, 3279, or 3277GA, you should be aware of the following incompatibilities:

- Graphics are displayed at the work stations using all-points-addressable screens. Support for programmed symbols is therefore limited to two single-plane sets. Existing programs that use programmed symbol sets directly (not through GDDM) to create graphics may therefore need to be rewritten.

- User-defined character sets or fill patterns for GDDM application programs may need modification to suit the cell size of the new displays.

- The maximum size for a picture segment that is to be transferred between host and work stations is 63 K bytes. If you want to transfer a segment that is larger than 63 K bytes, GDDM will automatically split it into manageable segments and transfer them in unretained mode, thus precluding interactivity.

- The work stations do not support the attachment of 3270 magnetic devices or of a selector pen. However, the Cursor Select key on the work station keyboard provides an input function equivalent to that of the selector pen.

- Application programs for the 3277GA that have been written to use GDDM need only minor modifications to run on a work station that has a 5379 Display with the dual-screen feature.

- The Graphics Control Program does not support the data stream that is used by the 3277GA. Application programs that generate their own data stream for the 3277GA thus require major modifications before use with the Graphics Control Program.

For limitations on running 3270 programs with the work stations, refer to Appendix B.

Host Performance Highlights

Existing 3270 graphics users will generally benefit from improved system performance when using the work stations with GDDM Release 4. GDDM Release 4, together with the Graphics Control Program, uses the programmability and segment storage of the work stations to offload some commonly-used graphics functions from the host processor to the work station. The following advantages result:

- Host path-length is reduced.

- The data stream for many graphics pictures is reduced.

- Where the application has been suitably designed, the number of interactions with the host computer is reduced when moving segments of a picture around at the work station. Furthermore, only the **changed** segments of a picture need be retransmitted from the host computer.

Appendix D contains a more detailed statement of these performance improvements.

Local Environment

Existing IBM Personal Computer Application Programs

Existing IBM Personal Computer application programs are supported on the work stations by:

- Emulation of the IBM PC Color Graphics Adapter

- Emulation of the PC keyboard interrupts

- Software emulation of the IBM PC Basic Input Output Services (BIOS) interface.

Details of the limitations of the IBM PC Color Graphics Adapter emulation and of restrictions on programs that do **not** use the BIOS interface are given in Appendix B. Users must test particular PC application programs in which they are interested to ensure that they run on the work stations.

The Graphics Procedure Interface (GPI)

The GPI is a programming interface that gives a PC DOS application program access to the full graphics function of the work station. The application program uses the interface to:

- Create picture segments representing a picture

- Issue the commands that draw the picture

- Update the picture segments to alter the represented picture.

A sample program, in PASCAL, that uses the GPI is provided. Application programmers can call the PASCAL routines directly or use them as an example of how to invoke the GPI.

Part 2. Planning for the IBM 3270-PC Work Station

This part of the manual helps you to plan and prepare for delivery of the work station. This part enables you to:

- Know the devices, associated equipment, options, and programs available so that you can choose the arrangement most suited to your organization's needs.

- Plan the preparatory work that must be done before the work station can be put in place, used, and serviced.

- Plan for the conversion of your current applications and data to graphics use.

- Prepare for the training of people who will use the work station, write application programs for it, or provide technical support.

We assume that you have:

1. Planning experience with display terminals for your organization's business use.

2. Planning experience of subsystems if your work station is to be connected to a host system.

3. **Read Part 1 of this manual.**

Chapter 6. Choosing the Configuration

The minimum requirements for a work station are:

- One of the following:

  - IBM 5279 Color Display and 5278 Display Attachment Unit

  - IBM 5379 Display Model C01 and 5378 Display Attachment Unit Model C01

  - IBM 5379 Display Model M01 and 5378 Display Attachment Unit Model M01.

- One IBM 5371 System Unit, Model 12, 14, or 16

- One keyboard, standard or APL

- One IBM 3274 Control Unit with configuration support T or D

- Graphics Control Program

- PC DOS 2.1.

To this minimum configuration, you can add various optional input devices, output devices, and software. You can use the work station either stand-alone or attached to a host computer through an IBM 3274 Control Unit.

The following sections of this chapter provide information to help you configure a work station that meets the needs of your organization. These sections are:

- Displays and Display Attachment Units
- Options for the Displays
- Output devices
- Software
- Input devices
- System unit
- Attachment to a Host Computer.

Figure 29 gives an overview of the process described in the remainder of this chapter.

Some typical scenarios for work station configurations are given in Appendix C.

START

Choose Display and Attachment Unit

IBM 5279
Display

Lift/Tilt
and Swivel
Display
Stand

or

Tilt and
Swivel
Display
Stand

IBM 5278
Display
Attachment
Unit

OR

IBM 5379
Display
Model C01
(Color)
Model M01
(Monochrome)

IBM 5378
Display
Attachment
Unit
Model C01
(Color)
Model M01
(Monochrome)

IBM 5151
Monochrome
Display for
Dual Screen

Choose Output Device

IBM 5152
Monochrome
Graphics
Printer

IBM 5182
Color Graphics
Printer
Model 1

IBM 3852
Color Ink Jet
Printer

IBM 7371
Plotter

IBM 7372
Plotter

IBM 7374
Plotter

IBM 7375
Plotter

Choose Software

Choose Input Device

Keyboard
Standard or
APL

IBM 5277
Mouse and Pad

IBM 5083
Tablet with
Stylus or
4-Button
Cursor

Choose System Unit

Calculate Memory

Choose Diskette/Disk
Configuration

IBM 5371
System Unit
Model 12

IBM 5371
System Unit
Model 14

IBM 5371
System Unit
Model 16

Choose 5371 Features

END

Figure 29.   Choosing Your Work Station Configuration

Displays and Display Attachment Units

Choose one of the following for each work station:

- **IBM 5279 Color Display and IBM 5278 Display Attachment Unit** for general graphics work and presentation graphics, such as pie charts, histograms, bar charts.

  The 5279 Display includes:

  - A 356-millimeter (14-inch) color screen that uses 720 x 512 pels

  - A stand with tilt and swivel adjustment (Feature Code 7676/Part Number 1887676).

- **IBM 5379 Display Model C01 (color) and IBM 5378 Display Attachment Unit Model C01** for graphics work where greater screen content offers advantages; for example, in geographical mapping, electronic design, and complex business graphics applications.

  The 5379 has an additional processor in the 5378 Display Attachment Unit. This processor gives improved performance in the vector-to-raster conversion, clipping, transformation, and correlation functions, and also emulates the Personal Computer Color Graphics Adapter.

  The 5379 Display Model C01 includes:

  - A 483-millimeter (19-inch) color screen that uses 960 x 1000 pels

  - An integrated tilt and swivel stand.

- **IBM 5379 Display Unit Model M01 (monochrome) and IBM 5378 Display Attachment Unit Model M01** for graphics work that needs the clear definition of a black and white display; for example, in engineering drawing, text applications, and page composition applications.

  The 5379 Model M01 has a 483-millimeter (19-inch) monochrome screen that uses 960 x 1000 pels, and provides the same advantages as does Model C01.

Options for the Displays

The following options are available for the displays. Choose if required.

- **Alternative Stand (Feature Code 7675/Part Number 1887675))** for 5279 Displays only. This stand provides height adjustment in addition to tilt and swivel. If this feature is not ordered, the 5279 comes equipped with the tilt and swivel stand (Feature Code 7676/Part Number 1887676).

- **IBM 5151 Monochrome Display Model 2** for use with the 5379 Display to give dual-screen configuration. With this configuration, you can display text, alphanumeric data, menus, and system messages on the 5151 screen, thereby leaving the 5379 screen free for graphics pictures. The 5151 has a 305-millimeter (12-inch) screen, and requires a special adapter to be installed in the 5371 System Unit. Information about the adapter is given under "Features for the 5371 System Unit" on page 70.

Output Devices

Printers

Choose one of the following printers for each work station:

- **IBM 3852 Color Ink Jet Printer**
- **IBM 5182 Personal Computer Color Printer**
- **IBM 5152 Monochrome Printer**.

Details of the printers are given in Chapter 3.

Note: You must have a printer cable to attach the printer to the system unit. Details are given under "IBM Personal Computer Features" on page 70.

Plotters

Choose from the following plotters, which attach to the work station through an IEEE-488 adapter. The IEEE-488 adapter can support up to 13 devices.

- **IBM 7371 Color Plotter**, two pens, 215 x 279 millimeters (8.5 x 11 inches) paper size

- **IBM 7372 Color Plotter**, six pens, 279 x 431 millimeters (11 x 17 inches) paper size

- **IBM 7374 Color Plotter**, eight pens, 622 x 1231 millimeters (24.5 x 48.5 inches) paper size

- **IBM 7375 Color Plotter**, eight pens, 927 x 1231 millimeters (36.5 x 48.5 inches) paper size.

Further details about the plotters are given in the publications for the respective plotters.

Note: To attach a plotter to the 5371 System Unit, you will need an IEEE-488 Adapter and Cable feature. Details are given under "Special Features" on page 70.

If you wish to attach several plotters, you will need the IEEE-488 Adapter and Cable feature for the first plotter, and a standard IEEE-488 cable for each of the other plotters. You are responsible for supplying the standard IEEE-488 cables.

Software

The programs listed below are not included with the work station. Order them as features for **each** work station.

IBM PC DOS 2.1 (Feature Code 4120/Part Number 6024120)

You need this program to run the IBM 3270 Personal Computer Graphics Control Program and to run Personal Computer programs.

Graphics Control Program (Feature Code 1507/Part Number 1887697)

The IBM 3270 Personal Computer Graphics Control Program is a licensed program that provides screen management and multiple application support for the work stations, together with support for graphics functions for host and local applications.

Personal Computer Programs

IBM Personal Computer programs might be usable, but need to be tested by you to ensure that they are viable. IBM does not accept any responsibility for the use of these programs with the 3270-PC/G and /GX work stations.

Input Devices

Keyboard

You must have a keyboard to operate the work station. Choose your keyboard from the following:

- **Standard keyboard (Feature Code 5730/Part Number 6110344)**

- **APL keyboard (Feature Code 5731/Part Number 1351768).**

Note: You may order both keyboards for a single work station; only one keyboard, however, can be attached at any one time.

Other Input Devices

You may order either or both the following devices for your work station. Only one device, however, can be attached to the work station at any one time.

- **IBM 5277 Mouse** for control of the graphics cursor. The mouse is supplied with:

  - A 228 x 279 millimeters (9 x 11 inches) locator pad

  - An attachment cable.

  A spare locator pad (Part Number 1887687) for the mouse is also available.

- **IBM 5083 Tablet Model 2** with:

  - Four-button **Cursor (Feature Code 1511/Part Number 6248428)**, and/or

  - **Stylus (Feature Code 6351/Part Number 6248427)** for digitizing input and for control of the graphics cursor.

  Note: You may order both the four-button cursor and the stylus. Only one of the devices, however, can be attached to the tablet at any one time.

An attachment cable is included with the tablet.

System Unit

You can choose from a range of three system units:

- IBM 5371 System Unit Model 12

- IBM 5371 System Unit Model 14

- IBM 5371 System Unit Model 16.

The three models provide a choice of memory capacity, diskette/disk configurations, and feature slots. Therefore, before you make your choice, you must:

- Calculate how much memory your applications will need.

- Decide on the most suitable diskette/disk configuration.

- Decide what features you want.

Calculating Memory

To determine the amount of memory that you need:

1. Consider your memory requirements for graphics pictures, segments, and symbol sets.

2. Consider your memory requirements for Personal Computer applications.

3. Consider your memory requirements for the Graphics Control Program.

4. Use the tables in Appendix E to calculate your total memory requirements.

Some typical scenarios for work stations with various amounts of memory available to them are given in Appendix C.

Memory Requirements for Graphics Pictures

For a 5279 Color Display with a 5278 Display Attachment Unit, you must allocate memory for segments and symbol sets for host-computer and local (GPI) sessions.

Note: For a 5379 Display with a 5378 Display Control Unit, a separate area of fixed size (64 kilobytes) is used for this purpose.

Typically, business and general graphics pictures need up to 30 kilobytes of memory for segments. Many simpler pictures may require only five to ten kilobytes of segment memory.

More specialized applications, such as technical publications, detailed sketches, and complex layout diagrams produce pictures of widely varying memory segment size. Most of these pictures probably occupy less than 60 kilobytes.

Application-loadable symbol sets also occupy memory allocated to the session by the Graphics Control Program. Depending on its size and complexity, each symbol set occupies space typically from two to twenty kilobytes.

Memory Requirements for Personal Computer Applications

There are two memory requirements to consider:

1. For existing or new PC applications

2. For 3270-PC Graphics Control Program utilities.

The amount of memory for local PC applications is governed by the requirement of the largest PC program that you are going to run. Remember that this must include the PC DOS 2.1 requirement (25.5 kilobytes).

The 3270 PC Graphics Control Program utilities that run under IBM PC DOS 2.1 have the application memory requirements shown in Figure 30.

Utility	Application Memory Requirements
Save/Restore File Transfer Patch Local Print	13.3 k-bytes excluding space for PC DOS 2.1 15.8 k-bytes excluding space for PC DOS 2.1 6.9 k-bytes excluding space for PC DOS 2.1 76.8 k-bytes excluding space for segments, symbol sets, and PC DOS 2.1

Figure 30. Local Utility Program Requirements

PC DOS 2.1 requires 25.5 kilobytes of memory.

Memory Requirements for Graphics Control Program

The amount of memory required for the Graphics Control Program is dependent on the customization options chosen for the work station.

For details see Appendix E.

Diskette/Disk Configurations

Choose the diskette or disk configuration that is best suited to your applications.

A single 360-kilobyte diskette in the system unit meets the minimum requirement for running PC DOS and the Graphics Control Program.

The decision on whether a second diskette is needed mainly depends on the operating requirements of the local PC application programs you wish to run. If a second diskette is available, several Graphics Control Program operations will be simplified, especially those involved in creating and retrieving data such as print spooling and customization of the work station.

If a fixed disk is available, the Graphics Control Program will use it for loading the system and for print spooling. This improves performance and reduces the need to handle diskettes.

The amount of space needed on diskette/disk to hold a print file in picture interchange format is the same as the memory needed to display the picture plus a segment holding the graphic representation of any alphanumeric data in the picture. The segment could include programmed symbol set definitions.

Models of System Unit

Figure 31 shows:

- How much memory you can have in each model of system unit

- Any features you need to provide that memory

- The diskette/ disk configurations that are available with or without an IBM 5161 Expansion Unit

- Configurations that cannot have both the IEEE-488 Adapter and the Asynchronous Communications Adapter.

Choose one model of system unit for each work station from Figure 31.

	Available Memory in System Unit				
	With 5279 or 5379 Display				5279 only
Diskette/Disk	384kb	448kb	512kb	576kb	640kb
One 360kb diskette drive	Model 12 with no features	Model 12 with added features: One 64kb module	Model 12 with added features: Two 64kb modules	Model 12 with added features: Two 64kb modules and 64/256kb memory expansion option (See Note)	Model 12 with added features: Two 64kb modules and 64/256kb memory expansion option with one 64kb module (See Note)
Two 360kb diskette drives	/////////// /////////// /////////// /////////// /////////// /////////// /////////// ///////////	/////////// /////////// /////////// /////////// /////////// /////////// /////////// ///////////	Model 14 with no features	Model 14 with added features: 64/256kb memory expansion option (See Note)	Model 14 with added features: 64/256kb expansion option with one 64kb module (See Note)
One 360kb diskette drive and one 10mb fixed disk	Model 12 with added features: 5161 Expansion Unit	Model 12 with added features: One 64kb module and 5161 Expansion Unit	Model 16 with no features (See Note) OR Model 12 with added features: Two 64kb modules and 5161 Expansion Unit	Model 12 with added features: Two 64kb modules, 64/256kb memory expansion option, and 5161 Expansion Unit	Model 12 with added features: Two 64kb modules, 64/256kb memory expansion option with one 64kb module, and 5161 Expansion Unit
Two 360kb diskette drives and one 10mb fixed disk	/////////// /////////// /////////// /////////// /////////// /////////// /////////// /////////// /////////// ///////////	/////////// /////////// /////////// /////////// /////////// /////////// /////////// /////////// /////////// ///////////	Model 14 with added features: 5161 Expansion Unit	Model 14 with added features: 64/256kb memory expansion option and 5161 Expansion Unit	Model 14 with added features: 64/256kb memory expansion option with one 64kb module and 5161 Expansion Unit

Note: This configuration cannot have both the IEEE-488 Adapter and the Asynchronous Communications Adapter.

Figure 31. System Unit Memory Capacities and Diskette/Disk Configuration

Features for the 5371 System Unit

Special Features

The following special features can be added to the system unit:

- **IEEE-488 Adapter and Cable (Feature Code 3907)**, which provides an interface for the attachment of IBM 7371, 7372, 7374, and 7375 Color Plotters to the work station. You may attach devices other than these IBM plotters to the IEEE-488 adapter provided that they have the the same interface characteristics, but in this case you are responsible for device control programming. Up to 13 devices (IBM or non-IBM) can be attached to the IEEE-488 adapter. Only one device, however, can be accessed at any one time.

  The IEEE-488 Adapter and Cable feature provides both the IEEE-488 Adapter (Part Number 1503907) and the IEEE-488 Cable (Part Number 1503919). These may be ordered separately by part number.

IBM Personal Computer Features

The following IBM Personal Computer features can be added to the system unit:

- **Asynchronous Communications Adapter (Feature Code 2074)** for the attachment of non-IBM devices.

- **Communications Adapter Cable (Feature Code 2067)** for attaching devices to the asynchronous communications adapter.

- **64/256-Kilobyte Memory Expansion Option (Feature Code 1013)** for an additional 64 kilobytes of memory.

- **64-Kilobyte Memory Module Kit (Feature Code 1003)** for further memory in increments of 64 kilobytes.

- **IBM 5161 Expansion Unit Model 1**, which includes a 10-megabyte fixed disk and provides accommodation for selected features when no spare slots are available in the system unit. The expansion unit is supplied with a **Personal Computer Bus Extension Card** that must be installed in the system unit.

- **Monochrome Display/Printer Adapter (Feature Code 4900)** for the attachment of an IBM 5151 Monochrome Display Model 2 (for dual-screen operation).

- **Printer Cable (Feature Code 5612)** to attach the above printers.

- **Printer Stand (Feature Code 5614)** for the 5152 Monochrome Printer; this stand allows the paper forms to be placed under the printer.

Note: In some instances, certain features cannot coexist in a single work station; see "Installing Features on the 5371 System Unit" on page 71.

Installing Features on the 5371 System Unit

Figure 32 shows the configurations of the 5371 System Unit Models 12, 14, and 16 with no features installed. All the items (except basic memory) are on cards that plug into slots on the system card of the 5371. The position of each card is shown in the "System Unit Slot" column. (An asterisk indicates that a card is present.)

System Unit Slot	Item	Model 12	Model 14	Model 16
System card	Basic memory	256K	256K	256K
1	Display Unit Adapter	*	*	*
2	3270 System Adapter	*	*	*
3	Memory	128K	256K	256K
4	Keyb'd/Tablet/Mouse Adapter	*	*	*
5	Fixed-Disk Adapter			*
6	Diskette Adapter	*	*	*
7	Printer Adapter	*	*	*
8				

Figure 32.   Configurations for the 5371 System Unit Models

The features can be installed only in specified slots of the system unit. Use Figure 32 and the information given below to configure your features and to decide whether you need an expansion unit.

Note: In certain instances, certain combinations of features might not be possible because a required slot is already occupied.

- IEEE-488 Adapter - install in:

  - Slot 8 (if available) of the 5371 System Unit, or

  - Slot 5 (if available) of the 5371 System Unit, or

  - Slot 6 of the 5161 Expansion Unit.

- Asynchronous Communications Adapter - install in:

  - Slot 8 of the 5371 System Unit.

- 64/256KB Memory Expansion Option - install in:

  - Slot 5 (if available) of the 5371 System Unit, or

  - Slot 2 of the 5371 System Unit if an expansion unit is installed; see also "5161 Expansion Unit Model 1" below.

- 64KB Memory Module Kit - install on:

  - The memory card in Slot 3 of a 5371 System Unit Model 12, or

  - The 64/256KB Memory Extension card in Slot 5 of a 5371 System Unit Model 14 **without** a 5161 Expansion Unit, or

  - The 64/256KB memory extension option in Slot 2 of a 5371 System Unit Model 14 **with** a 5161 Expansion Unit; see also "5161 Expansion Unit Model 1" below.

- 5161 Expansion Unit Model 1: This is supplied with a Personal Computer bus extension card, which must be installed in:

  - Slot 5 of the 5371 System Unit, or

  - If the system unit is a Model 14 **with** the 64/256KB Memory Extension card, do the following:

    1. Move the 3270 System Adapter card from Slot 2 of the 5371 System Unit to Slot 2 of the 5161 Expansion Unit.

    2. Move the 64/256KB Memory Extension card in the 5371 System Unit from Slot 5 to Slot 2.

    3. Install the Personal Computer bus extension card in Slot 5 of the 5371 System Unit.

- Monochrome Display/Printer Adapter - install in:

  - Slot 5 of the 5371 System Unit, or

  - Slot 1 of the 5161 Expansion Unit

Attachment to a Host Computer

You can attach the work station through an IBM 3274 Control Unit to an
IBM System S/370 Processor or processor complex, or to an IBM 30XX or
43XX Processor. Information about attachment to a 3274 is given in
Appendix A.

Supplies

Ensure that you order consumables that will be needed when the work
station arrives, for example:

- Paper for printers and plotters

- Ribbons and inks for printers

- Pens and inks for plotters

- Blank diskettes for customization and running diagnostics.

Work Station Checklist

Now you have chosen your work station, check that you have everything you need.

You **must have:**

- Display

- Display attachment unit

- System unit

- Keyboard

- PC DOS 2.1.

You **might also have:**

- Expansion unit

- Monochrome display for dual-screen operations (with 5379 Display only)

- Printer

- Plotters

- IEEE-488 adapter

- Tablet with cursor and/or stylus

- Mouse

- Graphics Control Program

- Asynchronous communications adapter

- Additional memory

- Cables.

  Power cords are supplied with the various hardware elements of the work station. Signal cables are also supplied except for the following, which you must choose separately:

  - Attachment of devices (such as plotters) other than the first device to the IEEE-488 adapter in the work station; see "Special Features" on page 70.

  - Attachment of a device to the asynchronous communications adapter in the work station.

- Attachment of a printer to the work station; see "IBM Personal Computer Features" on page 70.

- Attachment of the work station to an IBM 3274 Control Unit; see *IBM 3270 Information Display System: 3274 Control Unit Planning, Setup, and Customizing Guide,* GA27-2827 or *IBM 3270 Information Display System: 3274 Control Unit Site Planning and Preparation Guide,* GA23-0064.

Chapter 7. Preparing for the Work Station

This chapter describes the preparatory work that you may wish to do before your work station is delivered. The environmental requirements are included for your information; the work stations are designed, however, to operate under heating and lighting conditions typical of commercial offices.

Environmental Considerations

Specifications

Temperature Range:

Operating: 15.6°C to 32.2°C (60°F to 90°F)

Nonoperating: 10°C to 43°C (50°F to 110°F)

Warning: To avoid overheating, all vents on the work station must be kept clear at all times.

Relative Humidity Range:

Operating: 50% to 80%

Nonoperating: 20% to 80%

Altitude: From sea level to 2135 meters (7000 feet)

Noise Emission:

46 dBA (adjusted decibels) at 1 meter (3.3 feet)

51 dBA at operator distance

Electromagnetic Compatibility

In some instances, the site chosen for a work station may have high ambient electromagnetic fields, which could interfere with the operation of the work station. These fields can result from nearby radio-frequency sources, such as transmitting antennas (AM, FM, television, and two-way radios), radar installations, and industrial equipment (radio-frequency induction heaters, arc welders, and insulation testers). Three-phase power distribution lines can generate magnetic fields that may cause problems with the work station. As a precautionary measure, keep the work station as far away as possible from power distribution lines, preferably never closer than 1 meter (3.3 feet).

Other magnetic sources are, for example, transformers (including those installed within other units; see Notes below), distribution panels, rotating machinery, and electrical floor heating. A check should be made with your building engineer to identify the location of such magnetic sources.

Before positioning units or cabling, an installation planning review may be appropriate to assess the environment and to determine whether any special installation or product considerations are required to assure normal system operation and maintenance. Consult your IBM Installation Planning Representative.

Notes:

1. *Printers and plotters must be positioned at least 305 millimeters (1 foot) away from the display unit to avoid interference.*

2. *On dual-screen work stations, the 5379 and 5151 Displays might cause screen interference if they are too close together. A slight rearrangement of the displays should eliminate the problem.*

Electrostatic Discharge

High-resistance floor coverings and/or plastic seat covers, in conjunction with low humidity, can cause high electrostatic charges to build up on people and furniture. Avoid combination of these factors, because the electrostatic discharges can cause personal discomfort and interference with the work station.

Work-Space Considerations

The work space is the total floor space required for efficient operation and servicing of the work station. The work station can be placed on almost any rigid table (see also "Dimensions and Weights"). For the maximum comfort and convenience of your operator, consider the following:

- The tabletop should be about 700 millimeters (28 inches) above floor level.

- The work space should be sufficient for the display, display attachment unit, the system unit, the keyboard, source documents, and (if ordered) optional devices; see "Dimensions and Weights." Allow sufficient space behind the work station for the connecting cables.

- The work station will need to be sited so that its power cords can easily reach grounded power outlets. See also "Electrical Requirements" on page 84 in this chapter.

- The work station is designed to work under the normal range of office lighting. The display unit should be sited away from the glare of direct sunlight or other bright sources of light, to avoid operator fatigue.

- The work station must be sited so that the vents on the various units are not obstructed.

Dimensions and Weights

Figure 33 shows the space requirements for the displays, display attachment units, system unit, and expansion unit. Figure 34 through Figure 37 show the dimensions, weights, and (where applicable) cable lengths for the individual units.
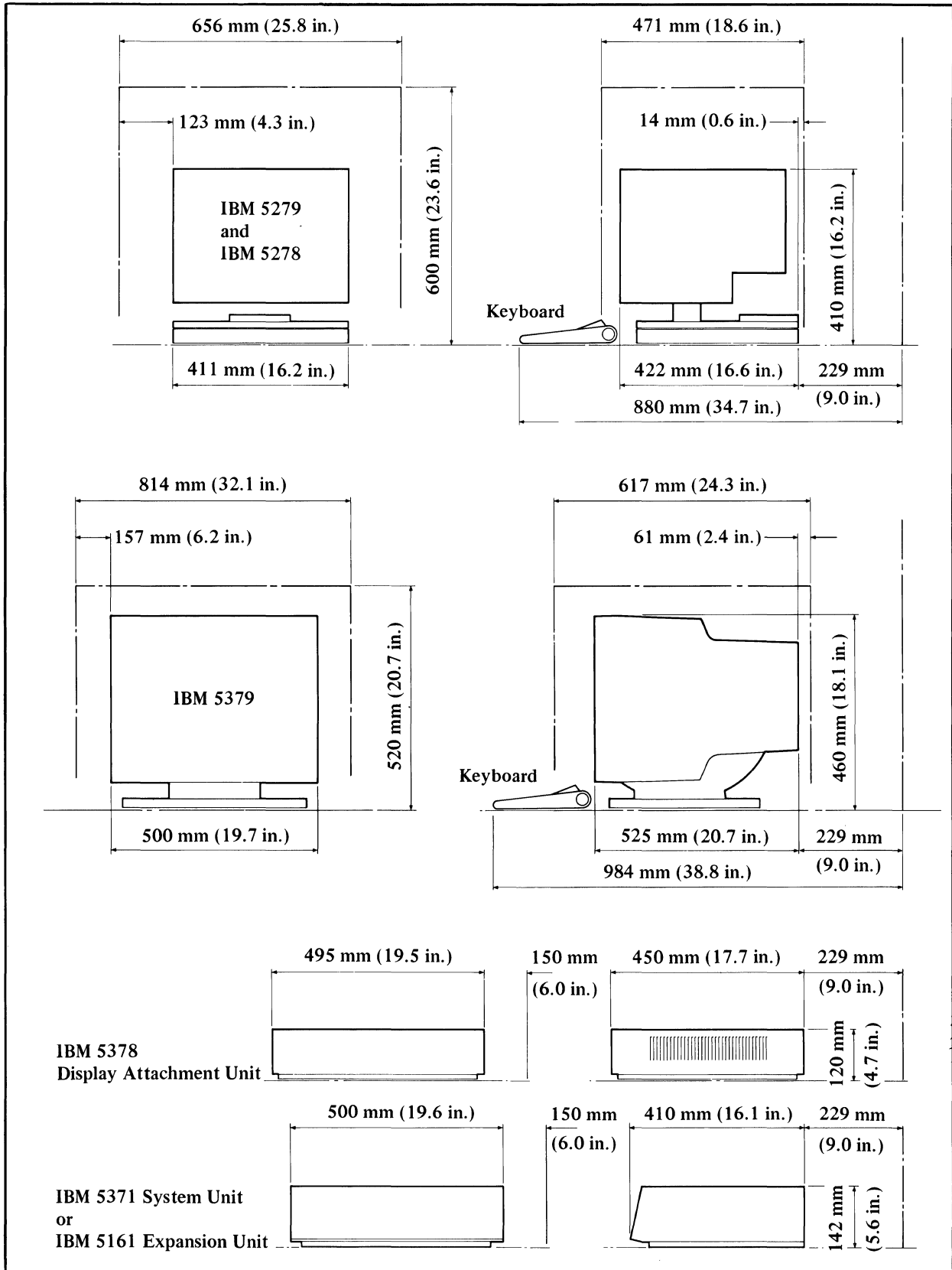
Figure 33. Space Requirements for Work Stations

Displays and Display Attachment Units

Unit	Height	Width	Depth	Weight
5279 Color Display on stand without height adjustment	359.0 mm (14.1 in)	411.0 mm (16.2 in)	398.0 mm (15.6 in)	20.3 kg (44.8 lb)
5279 Color Display on stand with height adjustment	From: 372.5 mm (14.7 in) To: 522.5 mm (20.5 in)	411.0 mm (16.2 in)	398.0 mm (15.6 in)	21.6 kg (47.6 lb)
5278 Display Attachment Unit for 5279	37.0 mm (1.4 in)	411.0 mm (16.2 in)	380.0 mm (15.0 in)	8.2 kg (18.0 lb)
5379 Display Model C01	460.0 mm (18.1 in)	500.0 mm (19.7 in)	488.0 mm (19.2 in)	32.0 kg (70.5 lb)
5379 Display Model M01	460.0 mm (18.1 in)	500.0 mm (19.7 in)	525.0 mm (20.7 in)	32.0 kg (70.5 lb)
5378 Display Attachment Unit for 5379	120.0 mm (4.7 in)	495.0 mm (19.5 in)	450.0 mm (17.7 in)	15.0 kg (33.0 lb)
5151 Monochrome Display for dual-screen configuration	279.0 mm (11.0 in)	380.0 mm (15.0 in)	305.0 mm (12.0 in)	7.9 kg (17.0 lb)

Figure 34. Dimensions and Weights of 5279, 5278, 5379, 5378, and 5151

System Unit, Keyboard, Expansion Unit, Mouse, and Tablet

Unit	Height	Width	Depth	Weight
5371 System Unit (See Note 1)	142.0 mm (5.6 in)	500.0 mm (19.6 in)	410.0 mm (16.1 in)	15.0 kg (33.0 lb)
Keyboard	64.0 mm (2.5 in)	560.0 mm (22.0 in)	230.0 mm (9.0 in)	4.2 kg (9.3 lb)
5161 Expansion Unit (See Note 2)	142.0 mm (5.6 in)	500.0 mm (19.6 in)	410.0 mm (16.1 in)	12.2 kg (27.0 lb)
5277 Mouse	25.0 mm (1.0 in)	66.0 mm (2.6 in)	99.0 mm (3.9 in)	168.0 gm (6.0 oz)
5083 Tablet Model 2	20.3 mm (0.8 in)	400.0 mm (15.8 in)	431.8 mm (17.0 in)	2.9 kg (6.5 lb)

Notes:

1. The weight given here is approximate only. True weight depends upon model and the features installed.

2. The weight given here is approximate only. True weight depends upon the features installed.

Figure 35. Dimensions and Weights of 5371, Keyboard, 5161, 5277, and 5083

Printers and Plotters

Unit	Height	Width	Depth	Weight
5152 Monochrome Printer	107.0 mm (4.2 in)	373.0 mm (14.7 in)	305.0 mm (12.0 in)	5.5 kg (12.0 lb)
5182 PC Color Printer	231.0 mm (9.1 in)	549.0 mm (21.6 in)	315.0 mm (12.4 in)	16.3 kg (36.0 lb)
3852 Color Ink Jet Printer	101.6 mm (4.0 in)	414.0 mm (16.3 in)	330.2 mm (13.0 in)	5.6 kg (12.3 lb)
7371 Color Plotter	127.0 mm (5.0 in)	431.8 mm (17.0 in)	342.9 mm (13.5 in)	6.1 kg (13.5 lb)
7372 Color Plotter	127.0 mm (5.0 in)	571.5 mm (22.5 in)	368.3 mm (14.5 in)	7.2 kg (15.8 lb)
7374 Color Plotter	1188.0 mm (46.8 in)	1087.0 mm (42.8 in)	557.0 mm (21.9 in)	59.0 kg (130.0 lb)
7375 Color Plotter	1188.0 mm (46.8 in)	1392.0 mm (54.8 in)	557.0 mm (21.9 in)	70.4 kg (155.0 lb)

Figure 36. Dimensions and Weights of Printers and Plotters

Cables Supplied with the Work Station

Description of Cable or Cord	Length	(Supplied With)
Power Cord (nonlocking plug)	1.8 m (6.0 ft)	5279 Color Display
Signal cable, 5278 to 5279 Signal cable, 5278 to 5371	680 mm (26.7 in) 1.0 m (3.3 ft)	5278 Display Control Unit
Signal cables, 5378 to 5379 (Four cables with Model C01; two cables with Model M01)	2.0 m (6.6 ft)	5379 Display
Signal cable, 5378 to 5371 Power Cord (nonlocking plug)	1.0 m (3.3 ft) 1.8 m (6.0 ft)	5378 Display Control Unit
Signal cable, 5151 to 5371 Power Cord (plugs into socket on the 5371)	914 mm (3.0 ft) 914 mm (3.0 ft)	5151 Monochrome Display
Power Cord	1.8 m (6.0 ft)	5371 System Unit
Signal cable, keyboard to 5371	1.8 m (6.0 ft)	Keyboard
Signal cable, 5161 to 5371 Power Cord	1.0 m (3.3 ft) 1.8 m (6.0 ft)	5161 Expansion Unit
Signal cable, 5277 to 5371	1.5 m (5.0 ft)	5277 Mouse
Signal cable, 5083 to 5371	2.0 m (6.6 ft)	5083 Tablet

Figure 37. Cables for the Work Station

Other Cables

Description of Cable or Cord	Length
IEEE-488 Cable	1.8 m (6.0 ft)
Communications Adapter Cable	3.0 m (10.0 ft)
Printer Cable	1.8 m (6.0 ft)

Figure 38. Other Cables

Safety

Safety is a major consideration in the design, engineering, and manufacture of IBM products.

- As with other electrical equipment, electrical grounding of the work station is a normal, essential measure. Be sure that the power receptacles are properly grounded. (See also "Electrical Requirements.") If you have any concerns about grounding arrangements, consult your electrician

- Although the 5279 Display can be lifted by one physically-fit person, it is more easily handled by two people.

- The 5379 Display must **always** be lifted by at least two people.

- Refer to "Dimensions and Weights" on page 79 to ensure that the table or desk is suitable for the work station.

DANGER

Hazardous voltages are present within the display. Only trained service representatives should be allowed access to inner parts of the display.

Electrical Requirements

A single-phase, **grounded** ac power outlet is required to supply voltage within the following range:

Voltage Group	Voltage Range	Maximum Working Current	Frequency
100 to 127 volts	88 to 146 volts	4.0 amperes	) 57 to) 63 hertz

Power Plugs and Receptacles

The power cord plugs that are supplied with the work station elements are of the standard three-pin type.

Ensure that sufficient power sockets are available for the work station. Each of the following elements requires a power socket:

- Display or display attachment unit (according to display type)

  Note: The 5151 Monochrome Display (for dual-screen configurations) does not require a power socket.

- System unit

- Expansion unit (if installed)

- Printer (if installed)

- Plotter (if installed)

CAUTION
The power attachment cable plug (when supplied) is approved for use with this machine and meets the relevant testing laboratory or country/test-house standards. For the user's safety, the plug must be connected to a properly wired and grounded receptacle. An improperly wired receptacle could place a hazardous voltage on accessible metal parts of the machine. The customer is responsible for receptacle wiring.

Unpacking

The work station is delivered with *Unpacking Instructions* attached to the shipping carton; these instructions describe how to unpack the various elements of the work station. The final instruction directs the reader to the setup instructions contained in the *Guide to Operations* manual which is shipped with the work station.

The other manual shipped with the work station is a *Maintenance Information* manual, which should be stored for the service engineer.

Note: We recommend that you keep the packing materials if you intend to use a Service Exchange Center for maintenance.

Setup

The physical characteristics and environmental requirements of the work stations allow it to be set up in a normal office by customer personnel with a minimum of special arrangements.

After the work station is unpacked and placed in its prepared location, it is set up and checked out by using the step-by-step procedures contained in the the *Guide to Operations* manual. The setup procedure involves:

1. Checking the voltage rating of the equipment.

2. Positioning the various elements of the work station.

3. Connecting the elements (see Note below).

4. Switching on the power and running tests on the basic work station.

Problems that may occur during setup are dealt with in another chapter of the same manual. Instructions are also given for the attachment of optional devices, and for the testing of the complete work station. The optional devices are supplied with their own setup instructions.

Note: You will need a medium flat-blade screwdriver to connect some of the cables when you set up the work station.

Relocation of a Work Station

The work station can be relocated by your personnel with a minimum of inconvenience. Instructions for relocation are given in the *Guide to Operations* manual.

Customizing the Work Station

Customizing the 3270-PC work station requires you to define the hardware and software configuration. If the work station is to be attached to an IBM 3274 Control Unit, you must also specify the parameters that match the configuration of the 3274. The diskettes supplied with your work station contain the programs that allow you to operate in a variety of 3274 hardware configurations. The customization program (also on the diskettes) copies the appropriate files from the Graphics Control Program diskettes onto a blank diskette (or fixed disk if you prefer), which becomes your personal system diskette (or disk).

Note: You must supply the necessary blank diskettes.

You do not have to run the customization program on the work station for which the system diskette is intended. You can run it on any member of the 3270 PC family, or on an IBM Personal Computer.

If you already have a system diskette, you can use it as a starting point for recustomization, in exactly the same way that you would use the Graphics Control Program diskettes. The panels display your previous selections. You need respond only to questions where a change is needed.

The customization program displays a series of panels on the screen of the work station. These panels contain lists of options, most of which have default values assigned to them. You can change the values of these options to meet your own requirements. Other options require a value to be given. Full instructions on customization are given in *IBM 3270 Personal Computer: Graphics Control Program; User's Guide.*

Guidance for customizing the 3274 is given in Appendix A.

Training

The Graphics Control Program: Online Tutorial describes how to operate the work station and use the functions of the program. The tutorial involves practical participation by the user.

Copies of *Guide to Operations, Graphics Control Program; User's Guide*, and *Graphics Control Program; Work Station Programmer's Guide and Reference*, can be ordered through your IBM Marketing Representative.

Service Offerings

IBM provides a range of service offerings for your work station and its software. For details, ask your IBM Marketing Representative.

Planning Checklist

This checklist is provided as a sample plan. You may wish to modify it to suit your requirements. Consult your IBM Marketing Representative or your IBM Branch Office to obtain the necessary manuals that will assist you with the preparation of the site, programming of applications, and training of personnel. See also the list of publications given in the preface of this manual.

- Choose a site for the work station(s).

- Check the environment (temperature and humidity).

- Plan a convenient arrangement of the work station(s). Lay out a floor plan. Take care to avoid glare if you intend siting work stations near external windows.

- Determine the requirements for power sockets

- Arrange for electrical wiring to be installed if necessary

- Order cable(s) for attachment to the 3274 Control Unit

- Arrange for 3274 cable(s) to be routed through walls or floors (if necessary)

- Order the required manuals for the work station. If additional copies of manuals are required, order them at this time.

- Start operator and programmer training.

- Prepare for receipt and loading of diskettes at the IBM 3274 Control Unit.

- Order:

  - Blank diskettes (especially if you intend to use diskettes for customization).

  - Paper for printers and plotters.

  - Ribbons for printers.

- Prepare for receipt, unpacking, and setup of the work station(s).

Appendix A. Attachment to an IBM 3274 Control Unit

This appendix gives information about attaching the work station to an IBM 3274 Control Unit, and guidance for the customization of the 3274.

All IBM 3270 Personal Computer/G and /GX Work Stations have a 3270 System Adapter card that allows attachment to an IBM 3274 Control Unit. Attachment to the 3274 is by the same type of coaxial cable as is used to attach an IBM 3178, 3278, or 3279. The 3274 Control Unit can be attached, either locally or remotely, to an IBM System S/370 Processor or processor complex, or to an IBM 30XX or 43XX Processor.

Local attachment can be through 3274 Models 1A, 1D, 31A, 31D, 41A, and 41D using Systems Network Architecture (SNA) and non-SNA channel attachments. Remote attachment can be through 3274 Models 1C, 31C, 41C, 51C, and 61C using Synchronous Data Link Control (SDLC) and Binary Synchronous Communications (BSC) protocols.

3270-PC Graphics Control Program

The 3274 Control Unit provides the following services for the 3270-PC Graphics Control Program:

- Attachment to the host computer in either Distributed Function Terminal (DFT) mode or Control Unit Terminal (CUT) mode. The difference between these two modes is described in Chapter 4.

- Support for four host-computer sessions in DFT mode, or for one host-computer session in CUT mode.

- Support for local copy to printers attached to the 3274 and using the systems network architecture (SNA) character string.

The Graphics Control Program supports the attachment of the work station to a 3274 that is, in turn, attached to the host computer by way of an SNA or non-SNA remote or local channel.

Coexistence with 3270 Family

The work station can coexist with 3278, 3279, and 3290 Display Stations, and with other members of the 3270-PC family on the same 3274 Control Unit. The number of display stations and work stations that can be attached to one 3274 depends upon the Logical Terminal configuration of those display stations and work stations that support multiple host-computer sessions; that is, the 3290s and the 3270-PC family.
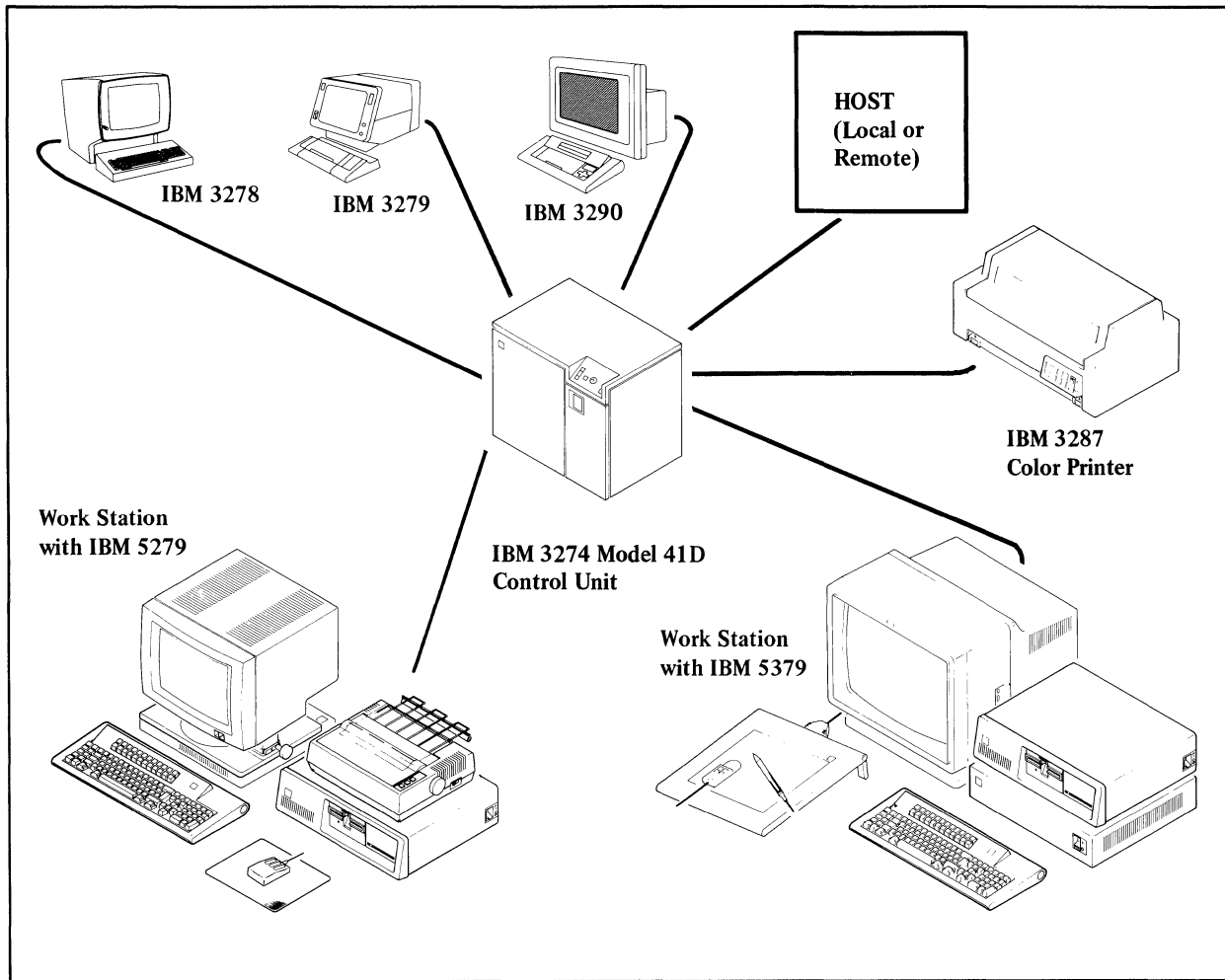

Figure 39. Example Configuration

Maximum Number of 3270 Graphic Personal Computers

You can designate up to four terminal addresses to a single work station. This requires one primary and four logical addresses for one physical port in the 3274 control unit. When planning to install the work station, you should consider the number of logical and physical addresses that are to be used, compared to the maximum number of addresses and ports that are available. The number of addresses and ports available depends upon the model of 3274 and the method of system attachment.

Note: If 3279 Color Display Stations are attached to the same 3274 as is the 3270 PC, the 3270 PC must be put on a port ahead of the 3279.

When a 3274 has 3270 PCs attached that are operating in distributed function mode, the maximum number of logical and physical terminals that can be attached to that 3274 is as shown Figure 40.

3274 Model	System Attachment	Maximum Number of 3270 PC Logical Terminals
1A	Channel, SNA	128
1C	TP SDLC	128
1C	TP BSC	32
1D	Channel, non-SNA	32
31A	Channel, SNA	128
31C	TP SDLC	128
31C	TP BSC	32
31D	Channel, non-SNA	32
41A	Channel, SNA	128
41C	TP SDLC	128
41C	TP BSC	32
41D	Channel, non-SNA	32
51C	TP SDLC	36
51C	TP BSC	32
61C	TP SDLC	76
61C	TP BSC	32

Legend:
    SNA - Systems Network Architecture
    SDLC - Synchronous Data Link Control
    BSC - Binary Synchronous Communication

Note: Non-SNA terminals require one port address per logical terminal.

Figure 40. Maximum Number of Terminals Attached to the 3274

Category B Terminal Restrictions

Category B terminals (for example, the IBM 3277 Display Station and 3284 and 3286 Printers) cannot be used on the same 3274 when the 3274 is customized to support 3270 PCs operating in distributed function mode.

Customizing the 3274 Control Unit

Customizing the 3274 usually involves a planner and someone who is responsible for the actual customization operation. The planner identifies and compiles the configuration information needed for each 3274 and gives that information to the person responsible for customizing the 3274. This person is prompted by a series of three-digit sequence numbers that require particular responses. Full details of the sequence numbers and relevant responses are given in the customizing guides for the 3274; see "Customizing Guides" below.

3274 Models and Configuration Support

Figure 41 shows the models of 3274 Control Unit and configuration support required for the 3270 PC. For graphics applications, the 5371 system unit must operate in DFT mode and the 3274 must have configuration support T or D.

3274 Model	Storage	Configuration Support (System Unit in DFT Mode)
1A, 1C, 1D 31A, 31C, 31D 51C	128K	T
31A, 31C, 31D 41A, 41C, 41D 51C 61C	192K	D

Note: Configuration support T must be at release level 31 or higher, and configuration support D at release level 61 or higher.

Figure 41. Configuration Support for 3270 PCs

When the 3274 is customized for a given support level (such as 31 or 61), the IBM 3270 Personal Computer must be tailored to operate with that support level. The 3274 configuration support release level is indicated by a two-digit validation number that follows the IBM part number printed on the label of the 3274 diskette. The customizing guides also have a two-digit validation number printed on the front cover. This number should match the number on the diskette label.

The display station or work station that is used for customization must be attached to Port A0 of the 3274.

Customizing Guides

To customize your 3274, you need either, or both, of the following publications:

- *IBM 3270 Information Display System: 3274 Control Unit Planning, Setup, and Customizing Guide,* GA27-2827 for:

  - Configuration support T

  - Models 1A, 1C, and 1D

  - Models 31A, 31C, and 31D

  - Model 51C.

- *IBM 3270 Information Display System: 3274 Control Unit Customizing Guide: Configuration Support D,* GA23-0065 for:

  - Configuration support D

  - Models 31A, 31C, and 31D

  - Models 41A, 41C, and 41D

  - Model 51C

  - Model 61C.

Customization Sequence Number Changes (Summary)

When a 3270 PC is attached to a 3274, some of the customization sequence numbers require responses that are different from those given in the customizing guides. Figure 42 shows the sequence numbers that are affected by the attachment of a 3270 PC, and summarizes the answers that you must provide for those sequence numbers. For more detail, see "Customization Sequence Number Changes (Explanation)" on page 95.

| Seq. Number | System Unit in DFT Mode | |
	Configuration Support T	Configuration Support D
112	Indicate number of Category A terminals	00
116	N/A	1
117	N/A	Port assignments
118	N/A	Displays addresses
125	N/A	See Note 1
170	2 (See Note 2)	2 (See Note 2)
171	171 XX XX XX XX XX	N/A
173	See Note 3	See Note 3

Legend: N/A - Not Applicable

Notes:

1. *If you want Request for Price Quotation (RPQ) 8K0978 (Dual-Function Clear Key) on the 3274, bit 0 of sequence number 125 must be "1".*

   If you want RPQ 8K0980 (Unsupported Control Code Translate) on the 3274, bit 1 of sequence number 125 must be "1".

2. *If you have an IBM 3290 Information Panel on the same control unit as the 3270 PC, answer "1".*

3. *See the 3274 customizing guide for further information.*

Figure 42. Sequence Numbers Affected by the 3270 Personal Computer

When you are customizing the 3274, your response to sequence number 170 (Distributed Function Terminals) reflects the inclusion of the 3270 PC in the 3274 configuration. Changes must also be made to other 3274 customization sequence numbers, depending both on your answer to sequence number 170 and on your configuration support level (D or T).

Customization Sequence Number Changes (Explanation)

- **112 Number of Category A Terminals**

  - For Configuration Support D, answer "00." If you answer with any number other than "00," you will customize only for CUT mode.

  - For Configuration Support T, indicate the number of Category A terminals (including 3270 PCs).

- **116 Individual Port Assignment (Configuration Support D Only)**

  This sequence number allows you to assign individual ports for use in DFT mode. The answer to sequence number 116 must be "1."

- **117 Port Assignment Specification Table (Configuration Support D Only)**

  This table is displayed on the screen when sequence number 116 is answered with a "1." The table allows you to set individual port assignments, as in the following example:

```
117                          NNN                        CCC

C@ . .     A00   A01     A02   A03     A04   A05     A06   A07
#I S .      1     4       2     4       1     3       0     0

C@ . .     A08   A09     A10   A11     A12   A13     A14   A15
#I S .      0     0       0     0       0     0       0     0

C@ . .     A16   A17     A18   A19     A20   A21     A22   A23
#I S .      0     0       0     0       0     0       0     0

C@ . .     A24   A25     A26   A27     A28   A29     A30   A31
#I S .      0     0       0     0       0     0       0     0

                                                         906-1
```

Where:

C@   is the physical 3274 port.

#IS   is the number of devices you want to assign to the port. Port A00 has a fixed response of 1. (IBM 3290 Information Panels and the 3270 PC in DFT mode cannot be attached to this port.) All other ports can be assigned one through five devices if a 3290 with a multiple screen is attached, or one through four devices if a 3270 PC with a multiple screen is attached.

NNN   is the operator code that appears if an error is detected.

CCC is the 3274 model specified in sequence number 151. If the model being used can be either SNA or non-SNA, the system type is also listed in this field.

906 is the response verification field. Once you have entered all your port assignments, change the 0 to a 1 and press the ENTER key. If your entries are syntactically correct, the Port Address Table (118) will be displayed. If there are errors in your entries, an operator code will appear in the NNN field, and your erroneous entries will be highlighted. If you want to return to the initial customizing screen, change the 0 after 906 to an A and press the ENTER key.

- **118 Port Address Table (Configuration Support D Only)**

This table is displayed to allow you to see the port assignments you set in number 117. For example:

```
118                                                              CCC

C@..      A00    A01    A02    A03    A04    A05    A06    A07
#IS.      1      4      2      4      1      3      0      0
P@..      002    003    004    005    006    007
S@..             008-01A 00B   00C-00E       00F-011

C@..      A08    A09    A10    A11    A12    A13    A14    A15
#IS.      0      0      0      0      0      0      0      0
P@..
S@..

C@..      A16    A17    A18    A19    A20    A21    A22    A23
#IS.      0      0      0      0      0      0      0      0
P@..
S@..

C@..      A24    A25    A26    A27    A28    A29    A30    A31
#IS.      0      0      0      0      0      0      0      0
P@..
S@..

                                                         907-0
```

Where:

C@ is the physical 3274 port.

#IS is the number of devices you want to assign to the port. You will need this information to customize the work station. A00 has a fixed response of 1. (3290 Information Panels and the 3270 PC, in DFT mode, cannot be this port.) All other ports can be assigned one through five devices if a 3290 with a multiple screen is attached, or one through four devices if a 3270 PC with a multiple screen is attached.

P@ is the primary address assigned to the device.

S@ is the range of secondary addresses assigned to the device.

CCC is the 3274 model specified in sequence number 151. If the model being used can be either SNA or non-SNA, the system type is also listed in this field.

907 is the response verification field. If you are satisfied with the port addresses shown, change the 0 after 907 to a 1 and press the ENTER key. If you want to return to the Port Address Table (sequence number 117), change the 0 after 907 to an A, press the ENTER key, and proceed as you would in sequence number 117.

- **125 Miscellaneous Feature Options (Configuration Support D Only)**

  This sequence number refers to any additional features you may have, for example, the Dual-Function Clear key (RPQ #8K0978). You will need this information to customize the work station. If you have Configuration Support D and you want this function, you must indicate "1" in bit 0 in response to sequence number 125.

  This sequence number also refers to Unsupported Control Code Translate (RPQ #8K0980). You will need this information to customize the work station. If you want this function, you must indicate "1" in bit 1 in response to sequence number 125.

- **170 Distributed Function Terminals**

  Your response to sequence number 170 reflects the inclusion of the 3270 PC in the 3274 configuration. The answer to sequence number 170 will be "1" if you will be supporting a 3290 Information Panel as well as the 3270 PC, or "2" if you will support only a 3270 PC. You will need this information to customize the work station.

- **171 Multiple Interactive Screens (Configuration Support T Only)**

  The sequence number is displayed as follows:

      171 XX XX XX XX XX

  The first column of XX shows the starting coaxial address. The second column shows how many 2-host session devices, the third shows how many 3-host session devices, the fourth shows how many 4-host session devices, and the fifth shows how many 5-host session devices. The following is an example of a possible response:

      171 08 03 02 01 00

  You will need this information to customize the work station.

- **173 3290 Options (applies also to 3270 PCs)**

  This sequence number applies to the 3270 PC, as well as to the 3290 Information Panel.

  Note: In order to do local copy in DFT (host) mode, your printer must have the SCS feature, "SCS Support for Structured Field and Attribute Processing," (Feature Code 9661). Refer to the 3274 Customizing Guide for additional information.

Appendix B. Compatibility Considerations

IBM 3270 Hardware Limitations

The following 3270 capabilities are limited or not available on the IBM 3270-PC/G or /GX work stations:

- 3278 Model 5 (emulated by means of horizontal scrolling)

- 3270 Diagnostic Reset Dump

- 3274 Entry Assist Feature

- Base (four color) color copy to the 3274 attached printer

- Binary Synchronous Copy Command

- Only one partition per session is allowed

- Graphics escape support is limited to that required for APL

- Separate keyboard clicker with mode option

- Keyboard types limited to standard typewriter layout with APL option

- Magnetic Reader Control and accessories

- Monocase switch

- Numeric lock

- Port 0 Customization function of the 3274 Control Unit

- Programmed Symbols limited to 2 sets with single plane only

- RPQs

- Security keylock

- Selector Light Pen

- Video Output.

IBM 3270 Software Limitations

The IBM 3270-PC is data stream compatible with IBM 3270 displays in alphanumeric application environments; existing alphanumeric applications will run on a 3270 PC unmodified (in their current screen size). No programming changes are required of current alphanumeric applications unless the program is affected by the hardware limitations listed above.

The 3270 PC will accept 3270 data streams and, in Distributed Function Terminal mode, supports extended highlighting and colors. The multiple screen facilities of the 3270 PC can be used without any modification of software.

IBM PC Hardware Limitations

The following IBM Personal Computer features or options are not permitted in the 3270-PC/G or/GX work stations:

1. IBM Personal Computer keyboard

2. Color Graphics Monitor Adapter (see "Emulation of the IBM PC Color Graphics Monitor Adapter")

3. Support for the monochrome display adapter is limited to that provided for the 5151 dual screen option with 3270-PC/GX.

Note: Other IBM Personal Computer options may be usable but need to be tested to assure viability; IBM does not accept any responsibility for them.

Emulation of the IBM PC Color Graphics Monitor Adapter

The function of the IBM PC Color Graphics Monitor Adapter is emulated by the 5278 and 5378 Display Attachment Units. There are differences in the detail of the function and its performance. Note in particular that the following features are **not** supported:

*   Light pen capability

*   Border color

*   TV monitor support

*   Background intensity

*   40 column by 25 row alphanumeric mode

*   Block cursor (5279 only)

*   Storage for multiple display formats

It should also be noted that only 8 colors are displayed on the 5279 and the 5379 when emulating the adapter.

IBM PC DOS 2.1 Limitations

Applications using the IBM PC DOS 2.1 must not:

1. Use interrupt vectors X'50' through X'57'.

2. Reprogram the 8259 Interrupt Controller.

3. Access storage addresses above the interrupt-level-12 pointer in BIOS (basic input/output system) except to reference the IBM Personal Computer display refresh buffer.

4. Disable interrupts, fail to issue an End-of-Interrupt or IRET on a hardware interrupt level, or mask selected interrupt levels for more than 100 ms.

5. Issue instructions to an IBM Personal Computer display adapter 6845 CRT Controller.

6. Use IBM PC DOS 2.1 print spooling.

7. Depend for successful operation on receiving control within a fixed amount of time after an interrupt.

    Such timing problems can occur if, for example, the application is to be used at the same time as graphics processing in the work station.

3270-PC Work Stations using the IBM 5272 Color Display

Most applications that run on IBM 5272 work stations will run on the 5279 and the 5379 work stations provided equivalent hardware features and sufficient storage are available but account must be taken of the following differences:

-   The IBM 5279 and 5379 work stations emulate only the Color/Graphics Monitor Adapter of the IBM PC. On IBM 5272 work stations the Monochrome Display Adapter is also emulated.

-   On the IBM 5272 work station host graphics is achieved using three triple plane and three single plane programmed symbol sets. On IBM 5279 and IBM 5379 work stations vector graphics are used. As with the IBM 3279, GDDM applications should migrate by using GDDM Release 4.

- For local applications, the 720 x 350 and 360 x 350 pel modes of the IBM 5272 work station's all-points-addressable adapter are not available on IBM 5279 and 5379 work stations.

- The 3270-PC Control Program for the IBM 5272 work station and the IBM 3270-PC Graphics Control Program for the IBM 5279 and 5379 work stations are not interchangeable.

Appendix C. Typical Scenarios for Work Station Configurations

Some typical scenarios for work stations with various amounts of memory available to them are given below. For these scenarios, it has been assumed that a realistic minimum size for a Personal Computer application is 128 kilobytes, including IBM PC DOS 2.1. The figures given are for a DFT SNA attachment.

The graphics memory needed for the picture segments and any special symbol sets of an interactive graphics application is directly related to the complexity of the picture. As a guide, not less that 30 kilobytes should be available for typical business graphics, and 60 kilobytes for engineering and scientific work. Editing applications that break down pictures into small parts will need more memory than those applications that deal in larger entities, or have little interaction.

Note: For picture viewing, host-computer and local sessions can draw in unretained mode, which does not require picture memory.

Work Stations with a 5279 Color Display and the Graphics Control Program

384-Kilobyte Memory

- **Either** a single host computer interactive graphics session:

  - 35-Kilobyte picture store

  - Local spool for print

  - IEEE-488 attachment support.

- **Or** a stand-alone Personal Computer interactive graphics session:

  - 128-Kilobyte Personal Computer region[2]

  - 55-Kilobyte picture store

  - Local spool for print

  - IEEE-488 attachment support.

- **Or** two host-computer sessions:

  - Either both with interactive graphics and a 30-kilobyte picture store each

  - Or only one with interactive graphics and a 70-kilobyte picture store.

- **Or** one host-computer interactive graphics session in unretained mode, and a nongraphics Personal Computer session:

  - 10-Kilobyte picture store for host-computer session

  - 45-Kilobyte Personal Computer region

  - IEEE-488 attachment support.

512-Kilobyte Memory

- **Either** a host-computer session and a Personal Computer session, one session with interactive graphics:

  - 60-Kilobyte picture store

  - 128-Kilobyte Personal Computer region.

- **Or** up to four host-computer sessions, two notepads, and a Personal Computer session:

  - Interactive graphics on one of the host-computer sessions

  - A 30-kilobyte picture store for the interactive session

  - 96-Kilobyte Personal Computer region

  - Local spool for print

  - IEEE-488 attachment support.

---

[2]   A Personal Computer region is the memory for PC DOS and its application programs.

576- to 640-Kilobyte Memory

Additional memory can be used to:

- Increase picture memory, or

- Increase the size of the Personal Computer session, or

- Include additional sessions, notepads, and other options.

Work Stations with a 5379 Display and the Graphics Control Program

For a 5379 Display, picture segments are stored in the 5378 Display Control Unit, and do not require 5371 memory except when graphics print is involved.

384-Kilobyte Memory

- **Either**

  - Four host-computer interactive graphics sessions

  - Two notepads

  - Local spool for print

  - IEEE-488 attachment support.

- **Or** a stand-alone Personal Computer interactive graphics session:

  - 235-Kilobyte Personal Computer region

  - Local spool for print

  - IEEE-488 attachment support.

512-Kilobyte Memory

  - Four host-computer interactive graphics sessions

  - Two notepads

  - IEEE-488 attachment support

  - 170-Kilobyte Personal Computer region.

The size of the Personal Computer region can be increased by reducing the number of host-computer sessions and/or the number of notepads.

576-Kilobyte Memory

Additional memory can be used to increase the size of the Personal Computer session.

Work Stations in Stand-Alone Mode

The work station can run without the Graphics Control Program as a stand-alone IBM Personal Computer under IBM PC DOS. All memory that is not required by DOS is available for the Personal Computer applications.

Appendix D. GDDM Release 4 Performance Improvements

GDDM Release 4 continues to consolidate the performance improvements introduced in Release 3. This appendix describes the performance improvements that can be expected.

Note: Any claim made in this appendix is subject to validation and confirmation in the General Availability announcement for GDDM Release 4.

The main changes result from support for the 5279 and 5379 work stations. These work stations offer:

- Vector-to-raster conversion in the work station

- Picture manipulation in the work station.

Graphics interactions for the 5279 and 5379 have the following differences compared with similar interactions on the 3279:

- Reduced host path length

  The graphics portion of a typical 3279 application program may be reduced by between 60% and 80%.

  Because there are significant nongraphics operations, the total CPU requirement of a representative GDDM Interactive Chart Utility session (80% of the interactions being alphanumeric panel display) is expected to reduce by 20-40% by changing to a 5279 or 5379.

- Data Streams

  Typical business graphs displayed on a 3279 have data streams in the range 10-30K bytes; this can be compressed to 5-15K bytes for remote operation. A typical ICU business chart using graphics text from the default symbol sets produces a data stream of less than 5K bytes when displayed on a 5279 or 5379.

  For the representative ICU session defined above, total data stream is expected to drop by 5-30% for the 5279 or 5379 compared with a remote (compressed) 3279. The data streams associated with the alphanumeric panel displays are unaffected by the type of work station on which the application program is being run.

Pictures for the 3279 have a maximum data stream of approximately 50K bytes. This can be compressed to approximately 25K for remote operation. There are pictures which become too complex to display fully on the 3279, because they cause **PS overflow**. PS overflow does not occur on a 5279 or 5379, and there is no limit to the complexity of the picture that can be displayed.

Specialized application areas, such as technical publications, cartographics, and civil engineering, produce pictures of widely varying complexity and data stream. These pictures could be less than 64K bytes when displayed on a 5279 or 5379, but can range up to 200K bytes and more.

GDDM application programs may use characters from fonts other than the standard font for the work station.

> If the work station session has been configured with sufficient segment memory, the symbol set containing the font is sent to the session's segment memory. GDDM simply references characters in the font. The work of expanding these is carried out by the work station, as are any transformations such as, scale, rotation, or translation. The symbol set will remain there for the duration of the GDDM session and can be used in subsequent picture displays.
>
> Symbol sets cannot be shared between sessions in the work station.
>
> GDDM-supplied symbol sets containing fonts are less than 11K bytes each.
>
> If there is insufficient memory in the work station, the character definitions are expanded in the host. For vector symbol sets, this adds 50-100 bytes to the data stream for each character from the symbol set.

- The ability to manipulate the picture within the work station will bring about performance gains for host application programs designed to take advantage of this.

These gains can only be made if there is sufficient segment memory in the work station for the GDDM application program to operate in retained mode. In retained mode:

1. If the host application program makes a change to one segment, only that segment (rather than the whole picture) need be retransmitted to the work station. In some cases, such as segment deletion or repositioning, only control information (rather than the segment itself) need be transmitted.

2. Operators can perform functions such as moving and picking segments in the work station. The work station will relay information about what the operator has done back to the host application program.

3. Pictures can be moved or scaled in the work station without reference to GDDM.

   Pictures that can be moved or scaled will have larger data streams than those which cannot. In the case of complex pictures, data streams may be more than doubled. Once the picture is in the work station, viewing operations performed on the picture will not cause any host or data stream activity. For pictures that are not defined for local moving and scaling, a new picture data stream will be transmitted for every viewing operation.

   If there is insufficient segment memory available for GDDM to work in retained mode, GDDM will automatically switch to unretained mode to display the picture. In this mode, work station interaction with the picture is not possible.

- A large proportion of pictures will have better response time especially where the host processor is either heavily loaded or of a small to medium type. The type of picture that may give a worse response time will contain a large number of short vectors.

Appendix E. Calculating Your Total Memory Requirement

Figure 43 gives a list of memory requirements from which you can calculate total memory. To do the calculations, you must understand the applications that will run on the work station, and the system to which the work station will be attached. The information you need is part of the information that is generated when you plan the total system, including the host processor, input and output attachments, and software support.

In Figure 43:

1. Select from Column A the items that apply to your installation. (You can use the "CHK" column to indicate your selection.)

2. Find the corresponding memory requirement in Column B.

3. Write the memory requirement in Column C.

4. Add together all the amounts you have written in Column C. The sum of the amounts is your total memory requirement.

Memory size estimates are necessarily approximate. If your calculations indicate that you need an amount of memory that is close to one of the memory sizes offered by the range of system units and memory features, you should:

- Choose the next memory size, if possible.

- Reexamine the planning basis of the calculations to see whether your needs can be addressed using multiple software configurations, or whether you have allocated memory for some session or function that you do not really require.

Column A Description of Memory Requirement		Column B (in k-bytes)		CHK	Column C (in k-bytes)
		5279	5379		
System Type:					
a. Single host session only:					
- SNA attached		288.0	233.0		
- Non-SNA attached		276.0	221.0		
b. Local PC session only		172.0	118.0		
c. Multiple host sessions:					
- SNA attached		298.0	244.0		
- Non-SNA attached		286.0	232.0		
d. Local PC session with one or more host sessions:					
- SNA attached		313.0	258.0		
- Non-SNA attached		301.0	246.0		
	System Type (See above)				
Input/output support and optional functions:					
● Local spool print support:					
- System without a local PC session	a, c	47.0	47.0		
- System with a local PC session	b, d	21.5	21.5		
● Plotter support by IEEE-488	a, b, c, d	4.0	4.0		
● Alphanumeric screen-to-screen copy support	c, d	6.0	6.0		
● Keystroke Record/Playback support	d	7.0	7.0		
● Notepad support	c, d	2.1	2.1		
● Small characters on 5279 to give 80 x 49 screen size	a, c, d	6.0	-		
		Total carried forward			

Figure 43 (Part 1 of 8). Memory Requirements for the Work Stations

| Column A | Column B (in k-bytes) | | CHK | Column C (in k-bytes) |
Description of Memory Requirement	5279	5379		
Total brought forward	-	-		
Session memory requirements:				
● Host session 1 will:				
- Run graphics	5.1	5.1		
- Use dual screen (fixed 1920 character screen size)	-	3.9		
- Use a 3278 Model 2 screen size (1920 characters)	3.9	3.9		
- Use a 3278 Model 3 screen size (2560 characters)	5.2	5.2		
- Use a 3278 Model 4 screen size (3440 characters)	7.0	7.0		
- Use other screen size: Add to Column C: $\dfrac{2.1 \times \text{number of characters}}{1000}$				
	Total carried forward			

Figure 43 (Part 2 of 8). Memory Requirements for the Work Stations

Column A Description of Memory Requirement	Column B (in k-bytes)		CHK	Column C (in k-bytes)
	5279	5379		
Total brought forward	−	−		
Session memory requirements: ● Host session 2 will: − Run graphics				
− Run graphics	5.1	5.1		
− Use dual screen (fixed 1920 character screen size)	−	3.9		
− Use a 3278 Model 2 screen size (1920 characters)	3.9	3.9		
− Use a 3278 Model 3 screen size (2560 characters)	5.2	5.2		
− Use a 3278 Model 4 screen size (3440 characters)	7.0	7.0		

− Use other screen size:
    Add to Column C:
 	
    $\dfrac{2.1 \times \text{number of characters}}{1000}$				

	Total carried forward			

Figure 43 (Part 3 of 8). Memory Requirements for the Work Stations

Column A Description of Memory Requirement	Column B (in k-bytes)		CHK	Column C (in k-bytes)
	5279	5379		
Total brought forward	–	–		
Session memory requirements:				
● Host session 3 will:				
– Run graphics	5.1	5.1		
– Use dual screen (fixed 1920 character screen size)	–	3.9		
– Use a 3278 Model 2 screen size (1920 characters)	3.9	3.9		
– Use a 3278 Model 3 screen size (2560 characters)	5.2	5.2		
– Use a 3278 Model 4 screen size (3440 characters)	7.0	7.0		

– Use other screen size:
    Add to Column C:
 	
      $\dfrac{2.1 \times \text{number of characters}}{1000}$				

	Total carried forward			

Figure 43 (Part 4 of 8).   Memory Requirements for the Work Stations

Column A	Column B (in k-bytes)		CHK	Column C (in k-bytes)
Description of Memory Requirement	5279	5379		
Total brought forward	–	–		
Session memory requirements:				
● Host session 4 will:				
– Run graphics	5.1	5.1		
– Use dual screen (fixed 1920 character screen size)	–	3.9		
– Use a 3278 Model 2 screen size (1920 characters)	3.9	3.9		
– Use a 3278 Model 3 screen size (2560 characters)	5.2	5.2		
– Use a 3278 Model 4 screen size (3440 characters)	7.0	7.0		
– Use other screen size: Add to Column C: $$\frac{2.1 \times \text{number of characters}}{1000}$$				
	Total carried forward			

Figure 43 (Part 5 of 8). Memory Requirements for the Work Stations

Column A Description of Memory Requirement	Column B (in k-bytes)		CHK	Column C (in k-bytes)
	5279	5379		
Total brought forward	–	–		
Session memory requirements:				
● Notepad 1 will:				
– Use a 3278 Model 2 screen size (1920 characters)	3.8	3.8		
– Use a 3278 Model 3 screen size (2560 characters)	5.1	5.1		
– Use a 3278 Model 4 screen size (3440 characters)	6.9	6.9		

– Use other screen size:
      Add to Column C:
 	
     $\dfrac{2.0 \times \text{number of characters}}{1000}$				

● Notepad 2 will:				
– Use a 3278 Model 2 screen size (1920 characters)	3.8	3.8		
– Use a 3278 Model 3 screen size (2560 characters)	5.1	5.1		
– Use a 3278 Model 4 screen size (3440 characters)	6.9	6.9		

– Use other screen size:
      Add to Column C:
 	
     $\dfrac{2.0 \times \text{number of characters}}{1000}$				

	Total carried forward			

Figure 43 (Part 6 of 8). Memory Requirements for the Work Stations

Column A Description of Memory Requirement	Column B (in k-bytes)		CHK	Column C (in k-bytes)
	5279	5379		
Total brought forward	–	–		
Session memory requirements:				
● The PC session will run graphics using GPI	3.1	3.1		

● Working memory for PC session:
 	
  Add to Column C (in k-bytes) the required memory including PC DOS 2.1.
  (See "PC Application Memory" earlier in this chapter.)				

CALCULATION COMPLETE FOR 5379 DISPLAY	Total Memory Requirement for 5379 Display			
	Total carried forward for 5279 Color Display			

Figure 43 (Part 7 of 8). Memory Requirements for the Work Stations

Column A Description of Memory Requirement	Column C (in k-bytes)
Total brought forward (5279 only)	
The following applies only to the 5279 Color Display:	

● Memory for symbol sets and segments:
 	
  Add to Column C (in k-bytes) the required memory for segments in each session (see "Graphics Picture Memory" earlier in this chapter):
 	
  - Host session 1
 	
  - Host session 2
 	
  - Host session 3
 	
  - Host session 4
 	
  - PC session	

Total memory requirement for 5279 Color Display	

Figure 43 (Part 8 of 8). Memory Requirements for the Work Stations

Glossary

This glossary explains terms and abbreviations used in the manual. The glossary contains terms and definitions from the *IBM Vocabulary for Data Processing, Telecommunications, and Office Systems,* GC20-1699; that book includes entries (preceded here by an asterisk, *) from the *American National Dictionary for Information Processing.* Refer to the index or to the *IBM Vocabulary* if you do not find here the term for which you are looking.

adapter card. A supplementary hardware part, added to the system unit of the work station, that expands basic function.

all points addressable (APA). (1) Pertaining to the ability to display each pel on a display screen independently. (2) Pertaining to the ability to manipulate each pel on a display screen individually.

alphanumeric. (1) Pertaining to a character set that contains letters, digits, and usually other characters, such as punctuation marks. (2) Relating to letters of the alphabet, numbers, and usually characters such as punctuation marks.

alphanumeric layer. Alphanumeric information that may be displayed in addition to graphics information.

APA. All points addressable.

APL (a programming language). A general-purpose language for diverse applications such as commercial data processing, system design, mathematical and scientific computation, data base applications, and the teaching of subjects such as mathematics.

application. (1) The use to which a data processing system is put. (2) The type of work that you do or get the work station to do for you.

application program. (1) A program that is written by or for a user and that applies to a user's work, for example, a charting application program or a payroll application program. (2) A program

written by or for your organization and applying to the task that you do at the work station, for example, a charting application program or a payroll application program.

area. A closed figure that can be filled with a pattern or a color.

attribute. In the Graphics Control Program, a characteristic that controls the appearance of a graphics primitive.

background color. (1) The color of the window "writing surface." (2) The color used as background for graphics primitives.

BASIC. Beginner's all-purpose symbolic instruction code. (1) A high-level, widely used computer programming language. Some BASIC is resident in the personal computer part of your work station. (2) A widely used computer programming language.

binary synchronous communication (BSC). (1) Communication using binary synchronous line discipline. (2) A uniform procedure, using a standardized set of control characters and control character sequences, for synchronous transmission of binary-coded data between stations.

blinking. A means of highlighting the cursor or some part of displayed information (such as a character) by alternately displaying and suppressing it.

business graphics. The methods and techniques for presenting commercial and administrative information in chart form.

cell size. The maximum physical boundary of a single symbol and its background.

character. A letter of the alphabet, a numeral, or any of the punctuation marks or special symbols (such as % and #) created by a key on your keyboard, and the blank created by the spacebar.

character set. (1) A defined collection of characters. (2) An attribute that specifies the symbol set to use for a character string.

CICS. Customer Information Control System.

clipping. Eliminating those parts of the picture that are outside the viewing window. Also known as **scissoring.**

CMS. Conversational monitor system.

color convergence procedure. The method of "sharpening" the edges of colored, displayed information. The procedure permits accurate aligning of the primary colors (red, green, and blue) that produce other colors on the screen.

configuration. (1) (TC97) The arrangement of a computer system or network as defined by the nature, number, and chief characteristics of its functional units. More specifically, the term **configuration** may refer to a hardware configuration or a software configuration. (2) The devices and programs that make up a system, subsystem, or network.

control unit terminal mode (CUT mode). (1) The way that your work station is attached to the IBM 3274 Control Unit, during customization, that allows only one host session. (2) A method of operation that allows one logical terminal.

coordinates. Values that specify a position in space.

Copy. The work station function that allows you to copy alphanumeric data between windows. You can copy into any window except the personal computer window, or copy from one area to another within the same window except in the personal computer window.

correlation. The processing of segments to determine if any parts of the picture they define lie within the pick window that is set.

cursor. A movable locator.

cursor-movement keys. The arrow keys that can move the screen cursor. You use the black cursor-movement keys, in the right-hand control-keys area, for host computer applications and for work station control mode; you use the blue cursor-movement keys in the numeric keypad for personal computer applications. When you are browsing, the keys move the data in the window; when you are changing the size of a window, they move the borders of the window; when you are

copying, they move the cursor to mark the source and the target area.

Customer Information Control System (CICS). An IBM program product that enables transactions entered at remote terminals to be processed concurrently by user-written application programs. It also includes facilities for building, using, and maintaining data bases.

customization. (1) The process in which the Graphics Control Program is adjusted to match your work station and the way you want to use it. (2) The process of adapting the IBM 3274 Control Unit to meet the requirements of your work station.

customized system diskette. A diskette, for your work station, on which files from the Graphics Control Program diskettes have been copied during the customization procedure.

CUT mode. Control unit terminal mode.

data stream. All data transmitted through a channel in a single read or write operation.

default. (1) A value that is assumed when none has been specified. (2) An alternative value, attribute, or option that is assumed when none has been specified.

DFT mode. Distributed function terminal mode.

digitizer. A device for converting text or a picture, printed on paper, into a digital representation.

diskette. A flexible magnetic disk, permanently enclosed in a semi-rigid protective jacket and used for storing data.

diskette drive. A device in the system unit that stores information in, and retrieves information from, removable diskettes.

distributed function terminal mode (DFT mode). (1) The way that your work station is attached to the IBM 3274 Control Unit, during customization, that allows up to four concurrent host sessions. (2) A method of operation that allows multiple concurrent logical terminal sessions.

DOS. Disk Operating System.

dragging. (1) (TC97) In computer graphics, moving all or part of a display group in a display space in such a way that the group continuously follows the pointer as though it were attached. (2) Moving part of a picture continuously through a series of positions tracked by the work station user.

drawing controls. In the Graphics Control Program, the controls (such as arc parameters, transforms, and viewing window) that determine how a picture is drawn.

drawing order. An instruction that the Graphics Control Program follows during a drawing process. The order can, for example, (1) specify a graphics primitive to be drawn, (2) change the attributes or drawing controls to be used, or (3) call a segment.

dual-screen work station. A work station having an IBM 5379 Display and an IBM 5151 Monochrome Display Model 2. During a graphics application that has been customized to be dual-screen, the 5379 shows pictorial information and the 5151 shows the text and commands needed with the picture.

Enlarge. A function that allows you to enlarge the dimensions of a window to its maximum size and, sometimes, to enlarge the size of characters.

expansion unit. An optional element (the IBM 5161 Expansion Unit Model 1) in a work station that serves as an extension to the system unit. The expansion unit contains a fixed-disk drive and accommodates adapters for options when no further adapters are available in the system unit.

file. A collection of data. This data can be programs, text, statistics, pictures, or charts. Files are stored in the host computer, on personal computer diskettes, or on the personal computer fixed disk. (Also known as **data set.**)

File Transfer. The work station function that allows you to send and receive files between the work station and the host computer, when you have a host-supported file transfer program.

file transfer program. A host computer program that allows the use of the File Transfer function on the work station.

fillet. A curved line drawn tangential to a specified set of straight lines.

fixed disk. A nonremovable storage that may be provided in a work station. The disk is made of rigid material with a magnetic coating. If present, the disk is housed in a drive in the system unit (or expansion unit) and is used for the mass storing of data.

foil. A transparency for overhead projection.

* font. A family or assortment of characters of a given size and style, for example, 9 point Bodoni Modern.

foreground color. (1) The color of characters or lines within a window. (2) In computer graphics, the color used to draw the **on** points of a graphics primitive in normal display or the **off** points of a graphics primitive in reverse-video display.

formatting. Preparing a diskette or fixed disk so that it can be used by the Disk Operating System and can accept DOS files.

four-button cursor. A hand-held device, with cross-hair sight, for indicating positions on the surface of a tablet.

full arc. A complete circle or ellipse.

GCP. Graphics Control Program.

GDDM. Graphical Data Display Manager.

GPI. Graphics procedure interface.

* graphic. (ISO) A symbol produced by a process such as handwriting, drawing, or printing.

Graphical Data Display Manager (GDDM). An IBM program product, running in a host computer, that manages display devices, printers, and plotters for graphics applications.

graphics cursor. (1) The movable marker on the display screen that shows, for example, where the next graphics action (such as drawing or moving a line) will occur. The cursor can have various shapes. (2) The movable marker on the display screen whose position and presence are controlled by the application program.

graphics layer. Graphics information that may be displayed alone or under a layer of alphanumeric information.

graphics presentation space. In the Graphics Control Program, the two-dimensional conceptual space in which a picture is generated, after any viewing transforms, for display.

graphics primitive. A basic element, such as a line, an arc, or a character string, that an output device uses in drawing a picture. (Also known as **output primitive.**)

graphics procedure interface (GPI). (1) The interface that provides communication between an application program and the Graphics Control Program. (2) The set of commands by which an application program communicates with the Graphics Control Program.

graphics segment. See **segment.**

* hardware. (ISO) Physical equipment used in data processing, as opposed to programs, procedures, rules, and associated documentation.

Help. The key that you press, in work station control mode, to get a panel of information about which functions and keys are currently active. You press the key again to remove the panel.

highlighting. Emphasizing some of the displayed information by, for example, blinking, changing color to white, reverse video, or underscoring.

histogram. A chart of frequency distribution, shown by rectangles, in which each value of the dependent variable corresponds to a range of values of the independent variable, for example, a count of persons in various age ranges.

home. The initial cursor position, as determined by the application program.

host computer. (TC97) In a network, a computer that primarily provides services such as computation, data base access, or special programs or programming languages.

host computer session. Same as **host session.**

host session. The period when your work station is communicating with the application program in the host computer.

IBM Personal Computer Disk Operating System (DOS). A program that interacts with the system unit and the disk or diskette drives to control the flow of data.

IEEE-488 adapter. The adapter on the system unit to which IBM 7371, 7372, 7374, or 7375 Color Plotters can be connected. You can attach up to 13 devices (IBM or non-IBM) to the adapter.

image. A rectangular area in which points are set to one of two states (**on** and **off**) for display.

* interface. A shared boundary. An interface might be a hardware component to link two devices or it might be a portion of storage or registers accessed by two or more computer programs.

keystroke recording. A function that saves or prints out a sequence of keystrokes. Your work station records groups of keystrokes and plays them back at designated locations on the screen.

kilobyte. 1024 bytes; 1K bytes.

locally interactive graphics. Displayed pictures or parts of pictures that you can work with directly, in a host session, by using the keyboard, a mouse, or a tablet. (Contrast with **output-only graphics.**)

locator. A logical input device (or mode of operation) that enables a user to identify and select a precise position on the display screen with a hardware input device such as a tablet, mouse, or keyboard.

logical terminal. A software simulation of a physical terminal.

menu. A list of available operations, in a menu panel, from which you select the operation you want.

message line/prompt area. The line on your screen, just above the operator information area, in which messages and prompts from the Graphics Control Program are displayed.

mouse. (1) A hand-held device (the IBM 5277 Mouse) that you move around the locator pad to position the graphics cursor on the screen. (2) A locator device that is moved around a surface to send positional information to the Graphics Control Program.

MVS/TSO. Multiple Virtual Storage with the time sharing option.

non-SNA. Pertaining to a channel-attached work station that does not use systems network architecture for transmission and control.

notepad session. The session that contains notes you make to yourself at the work station. You use this session like a sheet of scrap paper. The contents of a notepad disappear when you switch off the work station, unless you use the Save function to keep them.

numeric keypad. The rightmost area of your keyboard. You use it, in an active personal computer session, as a number pad or as a cursor-movement area. The Numeric Lock (NumLk) key toggles between cursor keys and number pad.

operator information area (OIA). The bottom line of your screen. This line gives you information about the condition of your work station and the host computer, and about which functions and sessions you are using.

output-only graphics. Pictures that you can view or have printed or plotted, but that you cannot work on.

overlay. A plastic guide that fits around a section of your keyboard and identifies keys that are valid during a specified application.

panel. The total set of information devoted to one purpose and designed to appear on the screen (or part of the screen) at one time, for example, a help panel or a menu panel.

parallel printer adapter interface. The adapter on the system unit to which a printer can be connected.

pattern. A symbol used repeatedly to fill an area.

PEL; pel. Picture element; same as **PIXEL.**

personal computer session. The period during which your work station is working as an IBM Personal Computer.

pick. (1) A match between the pick window and a graphics primitive during correlation. (2) The work station user's action that selects a part of a picture. (3) A logical input device (or mode of operation) that enables a user to identify and select a picture segment with a hardware input device such as a tablet, mouse, or keyboard.

picture element (PEL, PIXEL). (TC97) In computer graphics, the smallest element of a display space that can be independently assigned color and intensity.

picture interchange format file. A file whose content can be interpreted by both the work station and the Graphical Data Display Manager.

pie chart. A chart in the form of a circle divided into sectors, the angles of which represent proportionally the values to the whole.

presentation space. The area containing the data that goes on your display screen during each session.

program function (PF) key. A key that passes a signal to a program calling for a particular operation. The PF keys are located in the topmost area of your keyboard. The IBM Personal Computer function keys are part of the PF keys. Many of the work station control mode functions are located here; their names are printed on an overlay that fits around the keys.

resolution. (TC97) In computer graphics, a measure of the sharpness of an image, expressed as the number of lines per unit of length or the number of points per unit of area discernable in that image.

rotating. (1) (TC97) In computer graphics, turning all or part of a display image about an axis perpendicular to the display surface. (2) In three-dimensional graphics, revolving all or part of a picture about any required axis.

scaling. (TC97) In computer graphics, enlarging all or part of a display image by multiplying the coordinates of the image by a constant value.

screen background color. The color of the parts of the user area on the display screen that are not covered by windows.

scrolling. (TC97) In computer graphics, moving, vertically or horizontally, a display image in a manner such that new data appears at one edge as old data disappears at the opposite edge.

SDLC. Synchronous Data Link Control.

segment. A part of Graphics Control Program storage that contains drawing orders.

session. A working "connection" between your work station and a host computer, a notepad, or a personal computer. (See **host session, notepad session,** and **personal computer session.**)

SetUp. The work station function from which you can proceed to rearrange the screen. For example, you can change the size, position, and color of your windows.

SNA. Systems network architecture.

software. (TC97) Programs, procedures, rules, and any associated documentation pertaining to the operation of a computer system.

spool file. A collection of data written from the screen to a diskette or fixed disk for printing by the personal computer printer.

storage. A device, or part of a device, that can retain data.

stylus. (1) (TC97) In computer graphics, a pointer that is operated by placing it in a display space or a tablet; for example, a light pen, a sonic pen, a voltage pen. (2) A pen-like pointer for indicating positions on the surface of a tablet.

* symbol. A representation of something by reason of relationship, association, or convention.

symbol set. A defined collection of symbols.

Synchronous Data Link Control (SDLC). A discipline for managing synchronous, code-transparent, serial-by-bit information transfer over a link connection.

system diskette. See **customized system diskette.**

system unit. (1) The part of your work station that communicates between the display and the keyboard, and between the work station and the IBM 3274 Control Unit. The system unit does processing and control operations for the work station. (2) The IBM 5371 System Unit Model 12, 14, or 16, an element of the work station. The system unit contains a diskette drive (and, optionally, a second diskette drive or a fixed-disk drive) and accommodates adapters for optional devices.

systems network architecture (SNA). The description of the logical structure, formats, protocols, and operational sequences for transmitting information units through and controlling the configuration and operation of networks.

tablet. (1) (TC97) In computer graphics, a locator device with a flat surface and a mechanism that converts indicated positions on the surface into coordinate data. (2) The IBM 5083 Tablet Model 2, an optional input device for your work station. The tablet, with a four-button cursor or a stylus, enables you to address positions on the screen and to move the graphics cursor without using the keyboard.

time sharing option (TSO). An optional configuration of the operating system in the host computer that provides conversational time sharing from remote stations.

transform. (1) * In computer graphics, to change a display image, for example, by scaling, rotating, or translating. (2) The action of modifying a picture for display.

TSO. Time sharing option.

vector. In computer graphics, a directed line segment.

vector-to-raster conversion. The transforming of a programming definition for a vector into a display image that represents the vector.

viewing window. A two- or three-dimensional rectangular region of model space enclosing the part of the picture (as defined) that is to be drawn.

visibility. In the Graphics Control Program, the property of a segment that determines whether the part of the picture defined by the segment is to be displayed (or not) during the drawing process.

VM/SP-CMS. IBM Virtual Machine/System Product with the conversational monitor system (CMS) component.

window. The "opening" on the screen through which you view your application files. A window can be the same size as the full screen of your work station or it can be as small as one character. (The technical name for a window is a **viewport.**)

3270 data stream. The commands, control codes, orders, attributes, and data or structured fields for 3270 devices that are transmitted between a host application program and the work station.

3270 graphics data stream. The drawing orders, interpreted for 3270 graphics devices, that are transmitted between a host application program and the work station.

3270 system adapter. The adapter on the system unit (or expansion unit) to which the coaxial device cable to the IBM 3274 Control Unit is connected. (Also known as **distributed function communications adapter.**)

3274-attached printer. The centralized printer attached to the host computer by an IBM 3274 Control Unit. The printer serves a number of users.

Index

A

access methods   51
ACF/VTAM   51
additional memory   30, 70, 71, 72
   features
   personal computer features
   64kb memory module kit   30
additional 64K memory   70
all-points-addressable displays   45
alphanumerics with graphics   45
alternative stand (5279 only)   62
altitude   77
amperage
   See maximum working current
APL   48
APL keyboard   31, 65
applications, examples of
   CAD/CAM   18
   diesel engine   19
   floor plan   12
   geographical map   17
   multiple applications   11
   page composition   16
   steam locomotive   14
   tower chart   10
arc primitive   41
area fill pattern   41
area primitive   41
asynchronous communications adapt (RS-232-C)   71
asynchronous communications adapter
(RS-232-C)   30, 70
attaching a plotter   70
attachment cables   83
attachment to a host computer   73
attachment to 3274 Control Unit   48, 89
attributes   41

B

backup 3274 attachment   48
Basic Input Output Services (BIOS) of PC   55
Basic Telecommunications Access Method
(BTAM)   51
Basic Telecommunications Access Method-Extended
Support (BTAM-ES)   51
before the work station arrives   88
BIOS (Basic Input Output Services) of PC   55
BTAM   51
BTAM-ES   51

C

cables
   communications adapter cable (RS-232-C)   74
   IEEE-488   70, 74
   lengths   83
   not supplied with the work station   74, 75, 83
   printer   70
   printer cable   75
   supplied with the work station   74, 83
CAD/CAM   18
calculating memory   66
Category A terminals   95
category B terminal restrictions   92
cell size   41
cell size of new displays   54
channel attachment of 3274 Control Unit   49
character sets, GDDM compatibility   54
character size on 5279   49
character string primitive   41
character strings   41
checklist for planning   88
choosing
   diskette and disk configuration   68
   display attachment units   61
   displays   61
   input devices   65
   options for the displays   62
   output devices   63
   software   64
   system unit   66

the configuration 59
CICS/VS 52
clipping 44
CMS (Conversational Monitor System) 52
coexistence with 3270 family 90
color 41
Color Graphics Adapter emulation 55
color graphics printer 63
color plotters 82
   dimensions and weight 82
   7371 63
   7372 63
   7374 63
   7375 63
communications adapter cable 70
communications adapter cable (RS-232-C) 74
communications adapter, asynchronous
 (RS-232-C) 70, 71
compatibility considerations 99
compatibility, electromagnetic 78
compatibility, software 54
components of work station 21
configuration
   choosing 59
   support levels for 3274 92, 93, 95
configuration support levels for 3274 92
connecting a plotter 70
considerations for work space 79
Control Program 64
control unit terminal (CUT) mode 48
Conversational Monitor System (CMS) 52
copying between sessions 40
cords, power 83
current, maximum working 84
cursor 42
   control keys 42
   cross-hair 42
   four-button 33, 42, 65
   graphics 32, 33, 42
Customer Information Control System/VS
 (CICS/VS) 52
customer setup 85
customization 86
   sequence number changes (summary) 93
customizing
   guides for 3274 93
   the work station 49, 86
   3274 control unit 92
   3274 for distributed function terminal (DFT)
    mode 97
   3274 sequence number changes (explanation) 95
CUT (control unit terminal) mode 48

D

Data Dictionary, DB/DC 52
data stream reduction 55
DB/DC Data Dictionary 52
DFT (distributed function terminal) mode 48
diesel engine 19
dimensions and weight
   basic work station 79
   displays and display attachment units 81
   keyboard 81
   printers and plotters 82
   5083 Tablet Model 2 81
   5161 Expansion Unit 81
   5277 Mouse 81
   5371 System Unit 81
discharge, electrostatic 78
disk, fixed 28, 68
diskette drive 28, 68
display attachment units
   dimensions and weight 81
   5278 27, 61
   5378 Model C01 27, 61
   5378 Model M01 27, 61
display options 62
displays
   dimensions and weight 81
   5279 color display 24, 61
   5379 model C01 25, 61
   5379 model M01 26, 61
displays and display attachment units 61
distributed function terminal (DFT) mode 48, 95,
 97
DOS spool facility restriction 45
DOS 2.1 memory 67
drawing controls 41
drawing orders 41
dual screen 29, 62, 70
dual screen mode 48
Dual-Function Clear key (RPQ #8K0978) 97

E

echoing 42, 44
electrical requirements 84
electromagnetic compatibility 78
electrostatic discharge 78
emulation of keyboard interrupts 55
emulation of PC Basic Input Output Services
 (BIOS) 55
emulation, Color Graphics Adapter 55
environmental considerations 77
example of applications
   CAD/CAM 18
   diesel engine 19
   floor plan 12

PC DOS 2.1   64
spare diskettes   73
special features
    IEEE-488 adapter   29, 70, 71
    IEEE-488 cable   70, 83
    installing   71
spool facility, DOS, restriction   45
spool print facility   46
stand with height adjustment   62
stand-alone operation   49
steam locomotive application   14
storage
    diskette   28, 68
    fixed disk   28, 68
strings   42
strokes   42
stylus   33, 65
subsystems   51
supplies   73
symbol editors   52
symbol sets   41
system unit   28
system units   66
system, attachment to   73

T

tablet   42, 65, 81
    dimensions and weight   81
tabletop height   79
temperature range   77
terminal restrictions   92
tilt, swivel, and height stand   62
Time Sharing Option (TSO)   52
tower chart   10
training   87
transferring files   53
transforming   44
TSO (Time Sharing Option)   52
TSO Extensions (TSO/E).   52
two screens   70
two-dimensional projection   41
typical scenarios for work stations   103

U

unpacking   85
unretained mode   41
Unsupported Control Code Translate (RPQ
  #8K0980)   97
user training   87
utility, printing   46

V

validation number   92
vector character set   41
vector graphics   41
vector-to-raster conversion   44
Virtual Machine/System Product (VM/SP)   51
Virtual Storage Extended/Advanced Functions
  (VSE/AF)   51
Virtual Telecommunications Access Method
  (VTAM)   51
VM clear support   97
VM/SP   51
voltage   84
VSE/AF   51
VTAM   51

W

weight and dimensions
    basic work station   79
    displays and display attachment units   81
    keyboard   81
    printers and plotters   82
    5083 Tablet Model 2   81
    5161 expansion unit   81
    5277 Mouse   81
    5371 system unit   81
width, height, depth, and weight
    basic work station   79
windows   40, 44
work station checklist   74
work station components   21
work station printer   45
work station, choosing   59
work-space considerations   79

Numerics

3270 compatibility   54
3270 hardware limitations   99
3270 PC Graphics Control Program   64
3270 software limitations   100
3274 control unit
    attached printer   45
    attachment to   48, 49, 89
    backup   48
    category B terminal restrictions   92
    coexistence of terminals   90
    configuration support levels   92
    customization sequence number changes
    (explanation)   95

Introducing the IBM 3270 Personal Computer/G and /GX
Work Stations

Order No. GA33-3141-0

This manual is part of a library that serves as a reference source for systems analysts,
programmers, and operators of IBM systems. You may use this form to communicate your
comments about this publication, its organization, or subject matter, with the understanding
that IBM may use or distribute whatever information you supply in any way it believes
appropriate without incurring any obligation to you. Your comments will be sent to the
author's department for whatever review and action, if any, are deemed appropriate.

Note: *Copies of IBM publications are not stocked at the location to which this form is addressed.
Please direct any requests for copies of publications, or for assistance in using your IBM system, to
your IBM representative or to the IBM branch office serving your locality.*

Number of your latest Technical Newsletter for this publication . . .

If you want an acknowledgement, give your name and address below.

Name . . . .

Job Title . . . .

Address. . . . .

. . . . Zip . . . .

Thank you for your cooperation. No postage stamp necessary if mailed in the U.S.A.
(Elsewhere, an IBM office or representative will be happy to forward your comments or you may
mail directly to the address in the Edition Notice on the back of the title page.)
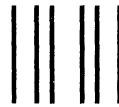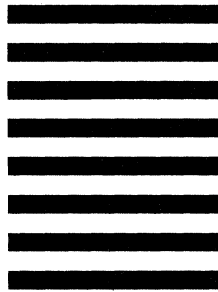
Reader's Comment Form

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS   PERMIT NO. 40   ARMONK, N.Y.

POSTAGE WILL BE PAID BY ADDRESSEE

International Business Machines Corporation
Dept. 812H,
FE Publishing Services and Distribution,
180 Kost Road,
Mechanicsburg, PA 17055, USA

IBM ®

IBM®