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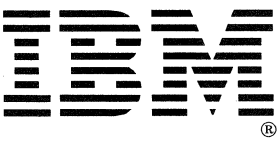

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Introduction and Welcome

These are the Proceedings of the IBM Personal Computer Seminar, designed for independent developers of products for IBM Personal Computers. The purpose of these Proceedings is to aid you in your development efforts by providing relevant information about new product announcements and enhancements to existing products. This issue is prepared in conjunction with this seminar. The Proceedings of future seminars for IBM Personal Computers also will be published and will cover topics presented at those seminars.

Throughout these Proceedings, the terms Personal Computer and family of IBM Personal Computers address the IBM Personal Computer, the IBM Personal Computer XT, the IBM PC*jr*, the IBM *Portable* Personal Computer, the IBM Personal Computer AT and the IBM PC Convertible.

Purpose

What is our purpose in issuing a publication such as this? It is quite simple.

The IBM Personal Computer family is a resounding success. We've had a lot of help in achieving this success, and much of it came from the independent developers.

As you proceed with your development, do you at times wish for some bit of information or direction which would make the job easier? Information which IBM can provide? This is the type of information we want to make available to you.

Since we want to be assured of giving you the information you need, we ask you to complete the questionnaire which appears at the end of these Proceedings. Your response to this questionnaire will be taken into account in preparing the content of future issues, as well as the content of seminars we will present at microcomputer industry trade shows.

Topics

The following list gives a general indication of the topics we plan to cover in future seminars and include in the IBM Personal Computer Seminar Proceedings:

- Information exchange forum — letters to the editor format
- Development tools — languages, database offerings
- Compatibility issues
- New devices — capacities and speeds
- System capacities — disk and memory
- Enhancements in maintenance releases
- Tips and techniques
- New system software
- Hardware design parameters
- Tips on organizing and writing documents for clear and easy reading
- Changes to terms and conditions

IBM TopView Version 1.10

TopView provides a single-user multitasking and windowing environment for PC-DOS applications. Many existing applications run in the TopView environment, taking advantage of some or all of TopView's features. The ability to switch quickly from one application to another is always available.

Major features of the operating environment include:

- Multitasking — TopView supports concurrent execution of more than one application or task. Applications that follow certain guidelines can run simultaneously in the background while another program runs in the foreground. The user can switch easily between applications either by using a pop-up menu or pressing keyboard or mouse buttons to cycle from one application to the next.

- Window Oriented — Under TopView, applications run in windows that occupy the entire screen or a portion of the screen.

- Copy, Cut and Paste — TopView lets the user transfer text on the screen from one application to another application. To use Cut and Paste, existing applications must have a filter table defining the appropriate positioning keystrokes that TopView is to use.

- DOS Services — The user can select some of the more frequently used DOS commands such as copy, print, erase and rename from the DOS Services option menu or directly enter a larger selection of commands at an input line. Directories can be sorted by name, extension, size and date/time to facilitate more flexible access to directory information.

- Graphics Applications — TopView supports graphics applications by giving the application control of the full screen when it is in the foreground. Medium resolution color (320 x 200 four color pixels) and high resolution black and white (640 x 200 two color pixels) video modes can be used for graphics applications. Since most graphics applications write directly into display memory, graphics applications are automatically suspended when they are in the background. However, if a graphics application also uses text mode, it may run in the background while it is in text mode.

- Pointing Device Support — TopView supports a pointing device such as a mouse to make menu selections and to control the windowing environment.

Details of these functions can be found in the IBM Personal Computer Seminar Proceedings, Volume 2, Number 6-1.

New Features of TopView Version 1.10

The following list summarizes the major new features and enhancements in TopView Version 1.10:

- Program swapping
- Batch file support
- Program Groups and Program Auto Start
- Enhanced DOS support
- Enhanced printer support
- Coexistence with the IBM PC Local Area Network Program Version 1.10
- Coexistence with programs written using the Graphics Development Toolkit Version 1.10 Virtual Device Interface (VDI)
- Coexistence with the IBM PC Network 3270 Emulation Program Version 2.00

Program Swapping

Program swapping allows the user to start more programs than will fit in memory at one time. When a program is selected from the Start a Program menu, TopView determines if there is enough memory to load the program. If there is sufficient memory, the swapping feature is not used and all programs can run concurrently. If there is not enough memory to start the program, TopView can move or "swap" a program already in memory to a disk file. The newly started program is then loaded into the partition previously used by the other program. A swapped program is restarted by using the standard TopView program switch options.

Because the TopView system memory portion of an application is retained in memory for all applications, the amount of memory available will

eventually limit the number of programs that can be started. In general, it is best to start the largest of several swapping programs first.

When swapping is required, there may be more than one program in memory large enough to be swapped to disk. TopView selects the program that can take least advantage of the multitasking environment. If there is no difference, user actions such as suspending or hiding a program may make a program more likely to be swapped to disk.

Once a program is loaded into a partition that it shares with another application, it will always swap into and out of the same partition. Several programs may use one swapping partition, and more than one swapping partition may be in use at any time.

The TopView Setup program prompts the user for a disk drive location (C, D, E... etc.) to be designated for program swapping. An IBM Personal Computer AT can be configured with the extended memory above 1 megabyte as a virtual disk. The amount of memory required for the TopView swap file depends on the number and size of the programs that are started. As much as a megabyte or more may be required for several large programs.

If the swap drive specification is left blank, programs will always remain in memory until they are ended. Swapping can be disabled so that all programs will always run concurrently.

Not all programs are swappable. Programs that process hardware interrupts (other than the keyboard), such as many of the communications programs, cannot be swapped. There is now a program behavior question in the program information file that specifies whether or not a program is swappable. For programs that are swappable, this question can be set to NO if the user wants a particular program to always remain in memory. A nonswappable program should be loaded first to ensure it has enough memory; then, the remaining memory can be dedicated to swapping programs.

Batch File Support

TopView Version 1.10 has been enhanced to support batch files. TopView supports all DOS commands in batch files except the following:

DOS Version 2.10

- ASSIGN
- CHKDSK
- CTTY
- FDISK
- FORMAT
- SYS

DOS Version 3.10 or Version 3.20

- ASSIGN
- CHKDSK
- CTTY
- FDISK
- GRAFTABL
- JOIN
- KEYBxx
- SHARE
- SUBST
- SYS

Note—Some of these commands, such as SHARE and KEYBxx, are appropriate to use before starting TopView. However, the JOIN and SUBST commands should be canceled before starting TopView.

Existing applications that are compatible with TopView can now be run from a batch file. Batch files can be started by selecting a title from the TopView Start a Program menu, similar to programs that are started directly using files with COM or EXE extensions. Batch files also have program information. For example, the memory requirement specified for a batch file must be sufficient for the largest program run from the batch file, plus the amount of memory needed for the resident portion of COMMAND.COM. For DOS Version 2.10, COMMAND.COM adds 4KB to the memory requirement, and for DOS Version 3.10 or Version 3.20 COMMAND.COM adds 5KB.

As with other programs, the program information for a batch file contains characteristics such as which video mode to use, whether or not the batch file window can be sized or moved, and whether the batch file can run in the background. Because a batch file can start several different programs, the program information data for the batch file should accommodate the program with the most restrictions under TopView. For example, if one program out of four in a batch file should not run in the background, the program information for the batch file should be set so that the batch file does not run in the background.

Programs can dynamically override the batch file program information settings. To do this, the first word of the title in the Start a Program menu should match the name used to invoke the program from the batch file. When TopView starts a program in the batch file, it determines if the program has its own program information. If so, some of this information is used to control how the program operates in the TopView environment. Programs running from batch files can specify and use shared programs. If program information is not found for a program running from a batch file, the program information settings for the batch file, itself, are used.

For programs started using batch files, TopView Version 1.10 also supports the use of character input/output redirection and piping. In addition, batch files under TopView Version 1.10 can start Terminate and Remain Resident programs, provided that they are otherwise compatible.

Program Groups and Program Auto Start

A utility program included with TopView Version 1.10 allows the user to specify a group of programs with one title and add that title to the Start a Program menu. When a program group is selected from the Start a Program menu, all programs in that group are started. The Program Group utility allow users to add, delete, or reorder programs in a group.

One program group can be specified as the Auto Start group. The Auto Start group automatically starts programs when TopView is started. This feature can be permanently enabled or disabled using the Program Group utility. Loading the Auto Start group also can be overridden temporarily by using a switch option when starting TopView.

Enhanced DOS Support

The DOS Services utility now supports a larger number of DOS commands in the DOS Other window. In addition, commands entered in the DOS Other window are saved at the end of a DOS Services session. The commands are remembered, allowing the user to select frequently used commands at a later time.

The COPY, ERASE, PRINT, RENAME and TYPE options of the DOS Services option window now support multiple file arguments, allowing the user to select multiple files from the directory window. The PgUp and PgDn keys are now supported for directory scrolling.

In addition to DOS Services, TopView Version 1.10 supports running the PC DOS Command Processor (COMMAND.COM) as an application. A Program Information File is included for the Command Processor. All DOS commands supported under TopView batch file processing are also supported under the Command Processor. As with batch files, input/output redirection and piping is supported under the Command Processor.

TopView Version 1.10 supports programs that make use of PC DOS Version 3.10 specific function calls. File sharing is also supported when SHARE is loaded before loading TopView. The PC DOS Version 3.20 commands REPLACE and XCOPY also are supported.

The number of available DOS file handles under TopView is increased to 20 per program. The total number allowed for the TopView system is the same as the number allowed by the DOS version being used.

Enhanced Printer Support

TopView Version 1.10 can manage up to three parallel printers and up to two serial printers. Printer resource management or ownership control is extended from LPT1 to all five logical devices (LPT1, LPT2, LPT3, COM1, COM2). TopView Version 1.10 supports applications that access serial printers directly through asynchronous communications ports, or through the process of redirecting a serial printer to LPT1 using the mode command before running TopView.

The printer resource management routines are enhanced so that user intervention is not necessary to transfer ownership of a printer from one application to another. If an application uses only BIOS routines to access a printer, the application is given ownership of the printer. Other tasks cannot access the printer until a 30-second period of no printer activity. Ownership of the device ends immediately when the application is terminated.

Note— Applications that access a communications port and that modify interrupt 3 or 4 vectors do not have a timeout period during which ownership can

be lost. If an application specifically issues a DOS OPEN statement when first accessing the printer, the application will have exclusive ownership with no timeout period until it either issues a CLOSE statement or it is terminated.

Changes to the background print facility allow up to 32 files to be added to the print list. TopView's background print facility can be accessed from DOS Services, the DOS Command Processor running under TopView, batch files or any program that can execute DOS commands.

Coexistence With IBM PC LAN Program Version 1.10

TopView Version 1.10 supports IBM PC LAN Program Version 1.10 on network redirector stations. When devices are redirected before starting TopView, all programs running under TopView can access those devices. In addition, each program can redirect devices for exclusive use by using function calls available in PC DOS Versions 3.10 and 3.20.

The IBM PC LAN Program Version 1.10 can be started under TopView to carry out network functions such as task control and sending messages. The IBM PC LAN Message Manager Program for TopView (provided with the IBM PC LAN Program Version 1.10) allows a redirector to receive network messages.

Coexistence With IBM Graphics Development Toolkit Version 1.10

TopView Version 1.10 supports a subset of the IBM Graphics Development Toolkit Version 1.10 Virtual Device Interface (VDI) device drivers, including the TopView Logical Mouse Device Driver. The supported drivers are the IBM PC 640 x 200 two-color high resolution graphics and the IBM PC 320 x 200 four-color medium resolution graphics Version 1.10 display drivers.

Programs that use these drivers are treated like other programs using graphics under TopView. They are given the full screen and are suspended when they are in the background in graphics mode.

Coexistence With IBM PC 3270 Emulation Program Version 2.00

All four IBM PC 3270 Emulation configurations are supported under TopView. Users can communicate with a host system through an IBM PC LAN adapter to a gateway, or directly through an SDLC adapter or an IBM 3278/3279 adapter.

Hardware Requirements

The following list describes the basic hardware requirements for TopView. However, for optimal performance and usability, a fixed disk drive and at least 512KB of memory is recommended.

- TopView Version 1.10 runs on an IBM Personal Computer, IBM Personal Computer XT, IBM *Portable* Personal Computer or IBM Personal Computer AT.
- TopView supports the following:
  - An IBM Monochrome Display with the IBM Monochrome Display and Parallel Printer Adapter
  - An IBM Color Display with the IBM Color/Graphics Display Adapter
  - An IBM Enhanced Color Display with an IBM Enhanced Graphics Adapter configured for Enhanced Color (in Normal Color mode)
  - An IBM Professional Graphics Display with an IBM Professional Graphics Controller in emulator mode

  Note— When using the IBM Professional Graphics Adapter, TopView must be configured for the keyboard or the parallel mouse pointing device.
- A minimum of 320KB of Random Access Memory. A larger amount of memory is necessary to execute several large programs at the same time, to execute programs with several windows, or to copy, cut or paste a large block of text.
- Two double-sided, double-density diskette drives or one diskette drive and one fixed disk.

TopView supports four specific mouse devices:

- Microsoft® Mouse for IBM Personal Computers (Parallel Interface) [1]
- Microsoft® Mouse for IBM Personal Computers (Serial Interface)
- PC Mouse™ by Mouse Systems (Serial Interface)[2]
- Visi On™ (Serial Interface)[3]

1 Microsoft is a registered trademark of Microsoft Corporation.

2 PC Mouse is a trademark of Metagraphics/Mouse Systems.

3 Visi On is a trademark of VisiCorp.

IBM has tested the use of these devices with TopView as of the announcement date of TopView. However, IBM does not endorse or recommend one non-IBM product over another and does not warrant these devices in any way. Other pointing devices can be used if a device driver exists or is written for the device according to the guidelines described in the TopView Programmer's ToolKit reference book.

Application Compatibility

Many applications that currently exist for the IBM PC are compatible with TopView. The compatibility of an application with TopView can be classified as follows:

- **DOS Application:** At a minimum, the TopView feature of program switching is supported with these applications. Additional features may be available if the application follows certain guidelines. TopView then can provide additional resource sharing services, i.e., multitasking or windowing. Copy and Paste can be supported if a filter table is provided.

- **TopView Aware:** These applications use two TopView-provided Interrupt 10 BIOS calls to write to the screen instead of writing directly to the hardware video buffer. The applications can continue to write directly to the video buffer in the standard PC-DOS environment. Multitasking, windowing, and program switching are available. Copy and Paste may be available, if a filter table is provided.

- **TopView Specific:** The application was designed using the TopView API (as described in the TopView Programmer's ToolKit) and has access to all TopView features. A filter table for Copy and Paste is not necessary.

Programming Guidelines

The following programming guidelines should be considered for applications to best take advantage of the TopView environment:

- Direct Video Memory Access

  Programs that write directly to the hardware video buffer can run only when they are the foreground application (interactive with the keyboard/ mouse device). These applications are suspended when their window is not the topmost window in the system. In the foreground, these applications take over the entire screen. The user cannot use the Size, Move, or Zoom functions to change the size or location of the window.

  TopView provides two new video BIOS function calls that allow an application in text mode to directly access video memory under standard PC DOS, and provide a logical video buffer for the application when it is running under TopView. Use of these function calls allows an application to run concurrently with other applications in the TopView environment. If the application is running in a non-TopView environment, BIOS considers these calls as no operation functions. All other video BIOS function calls operate as described in the *IBM Personal Computer Technical Reference* manuals.

  The Get Video Buffer BIOS call (INT 10H, AH = 0FEH) returns an address for a logical video buffer if TopView is present. The Update Video Display BIOS call (INT 10H, AH = 0FFH) is used by the application to notify TopView when to update the actual physical display after the application has modified the logical video buffer.

- Absolute Memory Loading

  TopView loads applications anywhere in free memory. An application should not try to load at absolute memory locations. All applications should use unsigned integer arithmetic when doing memory size calculations so that applications that run in system units with over 512KB of system memory will work properly.

- Accessing BIOS Keyboard Data Areas

  A program that reads the keystroke value directly from the BIOS keyboard buffer cannot run in the background. Its program information file must state that the program accesses the system keyboard buffer and does not run in the background. If the program changes the BIOS keyboard data area, its program information file also should state that it accesses the system keyboard buffer.

  If the program information file record is not set in this manner, keystrokes may be lost for other programs running under TopView, or not returned properly to the program that manipulates the BIOS keyboard data area.

- Direct Control of System Hardware

  For TopView to provide certain system services (switching, concurrent execution, windowing, etc.) to several applications at one time, TopView must control the hardware related to those services. If an application controls a hardware device, the program must allow other applications to share that device. An application can directly control some special devices; however, all applications must be able to share the standard hardware devices. Applications should explicitly open and close shared devices using standard system names and use DOS or BIOS calls to access the devices.

- Manipulation Of Interrupt Vectors

  For each task running under TopView, TopView maintains a copy of the software vectors within a range specified by the program's information file. This allows an application to use the user-assigned software vectors without worrying about whether or not other tasks in the system also use those interrupt vectors. However, the full range of vectors used must be specified correctly in the program information file.

  TopView maintains the standard DOS vectors: termination (22H), Ctrl-Break (23H) and critical error (24H) separately from the range of software vectors saved for a particular task. These vectors should only be set and read using the DOS function calls AH = 25H (Set Vector) and AH = 35H (Get Vector). Direct memory accessing of these vectors will not provide the desired results. Since these three vectors are handled differently from others, a program's information file need not include them in the range of vectors to be saved and restored.

  TopView also maintains the Keyboard Break (1BH) and Timer Tick (1CH) interrupt vectors automatically for each task running in the system. If an application modifies these vectors, it does not need to specify them in the program's information file.

  TopView does not maintain the hardware vectors (08H to 0FH) on a per-task basis. The hardware vectors are not changed and remain in effect from one task to the next.

  The keyboard hardware vector 09H is handled differently. If a application changes the keyboard hardware vector, TopView notes the change and uses the new vector whenever a keyboard interrupt occurs. This vector is in effect only when the application that changed the vector is the foreground application. In this way, each task running in the TopView environment can define its own keyboard interrupt handler. Like the Keyboard Break and Timer Tick vectors, if an application modifies the keyboard interrupt vector, it does not need to be specified in the program's information file.

- Copy Protection

  Any application using one of the following copy protection methods may not work with TopView:

  - Requires booting a special diskette
  - Uses a modified DOS
  - Requires critical timing to read disk sectors or tracks

- File Locking

  The TopView system has an automatic file locking mechanism to protect a task from other tasks updating the same file. However, multiple tasks can open the same file at the same time for read-only access. In general, a lock is activated when a file is opened. The lock remains active until the file is closed or the task is ended. The task that opens the file can access that file as many times as required; however, if the file was opened for write or read/write or using FCB's, no other tasks in the system can open that file until it is closed. (An exception to this occurs if a file is opened using FCB's in read mode, and it has been marked read-only using the DOS Attribute command.) For other copies of an application to access the same files for updates, the files should be closed when they are not being used.

  If a program uses overlays to segment the code, the overlay file should be opened in read-only mode or closed when it is not being used. If it is left open, a second copy of the program cannot be started because access to the overlay file is denied by the TopView file locking mechanism.

Note—If applications make use of the PC DOS SHARE mechanisms for file sharing, TopView will allow file sharing appropriately. (SHARE must be loaded before TopView is started.)

TopView Programmer's ToolKit

The TopView Programmer's ToolKit provides the system interfaces, programming tools and guidelines for developing applications that take advantage of the TopView operating environment.

The interfaces and tools are intended to make it easier to write programs that run with TopView. These tools and interfaces help programmers produce code to use in a program.

The Programmer's ToolKit includes the Window Design Aid for developing windows, menus, help windows, error windows and forms to be used within an application.

The ToolKit also includes a language interface to the IBM Macro Assembler, a sample high-level language interface for the IBM Pascal Compiler; utilities for merging panel files and converting panels to linkable object modules; and the interface to use when writing a pointing-device driver.

The documentation included with the Programmer's ToolKit explains the TopView programming environment, how to make use of the TopView programming interface and how existing applications can best take advantage of the TopView environment.

New Features of the TopView Programmer's Toolkit Version 1.10

The following enhancements have been added to the TopView Programmer's Toolkit Version 1.10:

- TopView 1.10 Subroutine Enhancements
  - A new STARTPGM subroutine call allows an application under TopView to start another application in a separate partition
  - A new POSTTASK subroutine call enables the programmer to post a task from a second-level interrupt handler or from another task
  - A new KMOUSE subroutine call allows an application to determine if the pointing device is the keyboard and, if it is, to control the keyboard mode (TopView versus application control of the numeric keypad keys)
- TopView 1.10 Object Class Enhancements
  - Enhancement of the pointer object control flag options to allow TopView to return mouse button press and button release information to the application as separate events
  - Enhancement of the keyboard object control flag options to allow a keyboard escape routine to be called after any keystroke or only after data keys are pressed
- TopView 1.10 Data Stream Command Enhancements
  - A new window data stream command to select scrolling of either text or attributes when any of the other window or field scroll commands are used
  - A new window manager data stream command that allows an application to easily reorder its windows based on a list of high order window handles (addresses)

IBM PC Local Area Network Program Version 1.10

The IBM PC Local Area Network (LAN) Program Version 1.10 replaces the IBM PC Network Program. The IBM PC LAN Program Version 1.10 contains all of the function previously provided in the IBM PC Network Program. These functions include:

- Peer-to-peer communications among IBM Personal Computers
- Multiple servers for file, print and message server functions
- Printer and disk sharing
- Print queue management

Details of these functions can be found in the IBM Personal Computer Seminar Proceedings, Volume 2, Number 5.

New Features of IBM PC LAN Program

- Peer-to-peer communications among IBM PCs on either the IBM PC Network or the IBM Token-Ring Network hardware
- Coexistence with IBM TopView Version 1.10 and IBM PC 3270 Emulation Program Version 2.00
- Coexistence with applications designed using the IBM Graphics Development Toolkit Version 1.10 Virtual Device Interface (VDI)
- Enhancements to the message handling facilities to increase function and improve ease of use

Operation With the IBM Token-Ring Network

The IBM PC LAN Program provides a network operating system extension on the IBM PC Network and the IBM Token-Ring Network. Use of the IBM PC LAN Program with the Token-Ring Network requires the IBM Token-Ring NETBIOS (Network Basic Input/Output System) Program. Also required is the adapter handler program supplied with the Token-Ring adapter diskette.

Coexistence with IBM TopView Version 1.10

IBM TopView Version 1.10 supports the IBM PC LAN Program on a redirector. Messenger function is achieved through the use of a new program, the IBM PC LAN Program - Message Manager for TopView. This program provides a functionally improved network messenger configuration when coexisting with the IBM TopView Program.

When the Message Manager is running under TopView, available network services are equivalent to those of the messenger configuration of the IBM PC LAN Program. At the same time, the user can take advantage of TopView's multitasking and windowing functions. Additionally, this environment supports the use of a mouse while performing operations in the Message Manager.

The redirector configuration of the IBM PC LAN Program is supported under the IBM TopView Program and must be started before TopView is invoked. Once in the TopView environment, the user may start the IBM PC LAN - Message Manager from the Start a Program window.

Connectivity Options

Host connectivity options greatly expand the possibilities of a LAN. When connected to a host, host data and applications become accessible to the IBM PC. The IBM PC can now do additional duty as a workstation with the extra benefits of intelligence and DASD of its own. For example, a file can be downloaded from the host, stored on the fixed disk, and made available on the network for shared access.

The IBM PC LAN Program Version 1.10 is compatible with three connectivity options that allow a program to access an IBM host:

- the family of 3270 Emulation programs, providing access to SDLC, SNA or non-SNA environments
- the IBM Asynchronous Communications Server Program, providing access to asynchronous communications
- the Series/1-PC Connect program, providing access to additional communication options

The IBM PC LAN Program Version 1.10 is compatible at the messenger level with the IBM PC 3270 Emulation Program, Entry Level. Compatibility with the IBM PC 3270 Emulation Program Version 2.00 has been extended so that all four configurations of the PC LAN Program are compatible with the four configurations of the IBM PC 3270 Emulation Program.

The PC 3270 Emulation Program Version 2.00 provides access to IBM System/370 host applications, 3270 emulation to IBM System/370 applications, file transfer capabilities to/from the host, and either personal computer- or host operator-initiated print. The flexibility of these functions is increased when they operate in a network environment.

An IBM Personal Computer acting as both a server and any configuration of the IBM PC 3270 Emulation Program, must be an IBM Personal Computer AT or an IBM Personal Computer XT. Nonservers in all 3270 Emulation configurations are supported on all IBM PCs, with the exception of the IBM *Portable* Personal Computer, which does not support the Standalone, Gateway, or Gateway and Network Station.

The IBM Asynchronous Communications Server Program provides the capability for IBM PCs on the IBM Token-Ring Network or IBM PC Network to access ASCII applications via switched communication lines. LAN-attached IBM PCs can share this communication server and its asynchronous communications line. The program provides access to the ROLM CBX II, a PBX or to the public switched network. Access to information providers, such as IBM Information Network, Dow Jones News/Retrieval Service®[4] and other services is made available to the IBM Token-Ring Network or IBM PC Network-attached IBM PCs.

The IBM Mainframe Communications Assistant and 3101 Emulation products are also compatible with the IBM PC LAN Program.

The IBM Series/1-PC Connect Program enhances both the disk and print server functions of the IBM PC LAN Program. The high capacity Series/1 disks and high-speed printers can be used as IBM PC LAN Program servers, expanding both the power and capabilities of the IBM PC as well as the PC Network, with no user coding or modifications to the PC Network environment.

A Remote Management Services function allows a network of PCs to be centrally managed in conjunction with the Series/1 Remote Manager. The Remote Manager supports the S/370 host Distributed Systems Executive (DSX) down to the Series/1. A function of the Series/1-PC Connect Program provides the file conversion necessary to convert the file from Series/1-PC format to PC DOS format and, optionally, to convert EBCDIC data to ASCII data and write it into an emulated PC disk on the Series/1. This file can then be shared by PC Network connected PCs, effectively providing the capability to distribute data down to PCs on the PC Network.

Virtual Device Interface Compatibility

The IBM Graphics Development Toolkit contains the Virtual Device Interface (VDI) that allows device-independent software and device-dependent drivers to communicate.

Now the IBM PC LAN Program Version 1.10 and software written for the VDI can coexist.

There is one consideration to be aware of while using the VDI. While running a VDI application that uses the Enhanced Graphics Adapter device drivers, the system request keys (Ctrl-Alt-Break) cannot be used to switch to the IBM PC LAN full-screen interface.

Message Handling Enhancements

Message handling enhancements to the IBM PC LAN Program Version 1.10 provide additional function and ease of use for the network user. Individual messages now may be saved in a user specified file. Messages stored in this file can be retrieved and sent at a later time. The message to be saved may be one that was just keyed in to send to another network user, or one received from another user. Messages can now be transferred from the View Message screen (with optional additional information) and sent to another network user. Maintaining a message log file has been made easier through the use of the View Next Unseen Message function. This function allows the user to skip the messages already viewed in the user message log file. The user may then proceed to view the remaining messages sequentially.

For the Send screen, four new function keys have been added. The F5 key is used to retrieve the first message from a user specified file into the message editor. The F6 key is used to retrieve subsequent messages from a user specified file into the message editor. The F7 key is used to save the message which currently appears in the message editor to a user specified file. The Ctrl-PgUp key combination is used to delete the currently displayed message from the user specified file.

4 News/Retrieval Service is a registered trademark of Dow Jones & Co.

The message which is retrieved may have been created in several ways. The message may have been originally entered in the message editor and then saved to a file; received from a remote sender and placed in the user's log file; or created using a text editor application. It is important to note that messages created through a text editor must still be less than 1600 characters long. Any message longer than 1600 characters will generate an error message when the user attempts to retrieve it.

For the View screen, two new function keys have been defined. The Ctrl-F4 key combination transfers the message currently being viewed to the message editor on the Send Screen. The Send Screen is then displayed. The Ctrl-F6 key combination retrieves the next unseen (not previously viewed) message in the user's log file.

Program Interface

All program interface functions provided by the IBM PC Network Program are contained in the IBM PC LAN Program Version 1.10. Three new functions have been added. These are:

- Network Version Check. Interrupt 2F, AX=B809
- Append Version Check. Interrupt 2F, AX=B702
- Network Print Stream Control. Interrupt 2A, AH=06
  - AL=01. Set print output into concatenation mode
  - AL=02. Set print output into truncation mode
  - AL=03. Truncate print stream

See Figure 1 on page 12 for a summary of the program interface provided by the IBM PC LAN Program Version 1.10.

INT 2FH

AH	AL	
88	00	NET COMMAND INSTALLATION CHECK
	03	GET SERVER POST ADDRESS
	04	SET SERVER POST ADDRESS
	09	NETWORK VERSION CHECK*
87	00	APPEND INSTALLATION CHECK
	02	APPEND VERSION CHECK*

INT 21H

AH	AL		
3D	OPEN FILE WITH SHARING SPECIFIED		
44	09	IOCTL	IS DEVICE REDIRECTED?
	0A		IS HANDLE LOCAL OR REMOTE?
	0B		CHANGE SHARING RETRY COUNT
59	GET EXTENDED ERROR		
5A	CREATE TEMP FILE WITH UNIQUE NAME		
5B	CREATE NEW FILE		
5C	00	LOCK BYTE RANGE	
	01	UNLOCK BYTE RANGE	
5E	00	GET MACHINE NAME	
	02	SETUP PRINTER CONTROL STRING	
5F	02	GET ASSIGN LIST ENTRY	
	03	REDIRECT DEVICE TO NET	
	04	CANCEL REDIRECTION	

INT 2AH

AH	
00	INSTALLATION CHECK
03	GET DEVICE SHARED STATUS
04	EXECUTE NETBIOS
05	GET NETWORK RESOURCE INFORMATION
06	NETWORK PRINT STREAM CONTROL*

Figure 1. Program Interface. Those marked (*) are new for Version 1.10.

Hardware Requirements

Use of the IBM PC LAN Program Version 1.10 requires one of the following IBM Personal Computers: IBM Personal Computer with or without an expansion unit, IBM Personal Computer XT, IBM Personal Computer AT (Models 068, 099 or 239), IBM Personal Computer AT/370, IBM Personal Computer XT/370, or IBM *Portable* Personal Computer, all with at least 128KB of memory.

Memory requirements for each configuration of the IBM PC LAN Program Version 1.10 (excluding DOS) are:

Redirector 28KB of memory and one dual-sided diskette drive

Receiver 47KB of memory and one dual-sided diskette drive

Messenger 139KB of memory and one dual-sided diskette drive

Server 186KB of memory, one dual-sided diskette drive and one fixed disk

The Message Manager for TopView requires an additional 98KB of memory.

Additional hardware requirements include:

- The IBM PC Network Adapter or IBM Token-Ring Network PC Adapter for each workstation.
- The IBM Color Display with the IBM Color/Graphics Display Adapter, the IBM Monochrome Display with the IBM Monochrome Display and Printer Adapter, or the IBM Enhanced Color Display with the IBM Enhanced Graphics Adapter.
- The IBM Enhanced Personal Computer keyboard on supported IBM Personal Computers.

Software Requirements

Operation of the IBM PC LAN Program Version 1.10 requires the IBM Personal Computer Disk Operating System (DOS) Version 3.10 or 3.20. DOS 3.20 is required for operation with the IBM Token-Ring Network or for operation with the IBM 3812 Pageprinter.

IBM PC 3270 Emulation Program Version 2.00

The IBM PC 3270 Emulation Program offers a wide variety of communication functions for IBM PCs, including support for several different workstation configurations.

When installed on an IBM PC (other than IBM PC*jr*) the program provides a subset of full 3270-type terminal functions. These include the following capabilities:

- Emulation of a 3274-51C Control Unit when attached to a host via SDLC communications attach.
- Emulation of a 3278 Model 2 or 3279 Model S2A display and a 3287 Model 1 or 3287 Model 2 printer.
- Emulation of a Distributed Function Terminal (DFT) Gateway when attached to a 3274 Control Unit local channel attached (3274 Model 31A or above) or remotely attached (3274 Model 31C or above) to a S/370 host for SNA support or to an IBM 3274 Control Unit locally attached (3274 Model 31D or above) to a S/370 host for non-SNA support.

The IBM PC 3270 Emulation Program, when installed on either an IBM PC attached to an IBM PC Network or IBM Token-Ring Network or on an IBM PC serving as a remote 3270 display station to IBM host computers, provides the following functions to the user of IBM PCs:

- Host file transfer capability and screen save. The file transfer facility also allows the use of the file transfer commands in PC-DOS BAT files and from the PC-DOS command line. One of the following IBM host supported file transfer programs must be installed at the host:
  - IBM 3270-PC File Transfer Program for VM System, Release 1 (5664-281) for VM/CMS;
  - IBM 3270-PC File Transfer Program for TSO System, Release 1 (5665-311) for TSO;
  - CICS/VS 3270 PC-File Transfer Program, Release 1 (5978-DHQ) for CICS/VS;
  - File Transfer Program (FTP), Version 2 (5668-932) for VSE/SP.
- Host or operator-initiated direct print to IBM PC printers attached to an IBM Personal Computer.
- A deferred print-to-disk feature which stores files on the PC disk or diskette and permits the appending of files to existing files on the disk or diskette (ASCII file creation).
- A key defining capability (Keyboard Remapping) which permits the user of the IBM PC 3270 Emulation Program to redefine keys on the PC keyboard. A user may redefine only the 3270 Emulation session or both the 3270 Emulation and PC session.
- A suspend and resume feature (Alternate Tasks), that allows the user to switch back and forth from an IBM PC DOS application to IBM PC 3270 Emulation without interrupting the 3270 session.
- PC Office Support - The Personal Services/PC Program (PS/PC) utilizes the Presentation Space Application Program Interface (PSAPI) for document distribution to/from IBM DISOSS systems with the IBM PC 3270 Emulation Program Version 2.00.

  The IBM PROFS/PC Support Program which supports the retrieval and distribution of PROFS documents with IBM host systems is also supported by the IBM 3270 Emulation Program, Version 2.00. This support is provided with the send/receive file transfer facility.
- An Application Programming Interface (API) written to allow an application program running in either a TopView window or the IBM PC 3270 Emulation Alternate Field to interface with the IBM PC 3270 Emulation display session. Through this interface, the application program can send keystrokes to the display session and copy data to and from the display session. (Refer to Application Programming Interface and Host Reference Guide for IBM PC 3270.)
- 3279 Model S2A Four Color Support that enables an IBM PC 3270 Emulation operator to use an IBM Color Display or Enhanced Graphics Display.

Coexistence on a Network

IBM PC 3270 Emulation uses the Network Basic Input/Output System (NETBIOS) interface to the IBM Token-Ring Network PC Adapter or to the IBM PC Network Adapter for local network communication. NETBIOS is a software interface between the adapter and IBM Personal Computer programs. NETBIOS places the unique features of a local area network into a standard format.

The IBM Token-Ring Network PC Adapter card and the IBM Token-Ring Network NETBIOS Program emulate the NETBIOS interface of the IBM PC Network Adapter card.

New Features of IBM PC 3270 Emulation Program Version 2.00

The IBM PC 3270 Emulation Program Version 2.00 provides extensive enhancements to IBM Personal Computer users accessing S/370-type host systems via 3270 emulation. This program replaces the IBM PC Network SNA 3270 Emulation Program and provides an Application Programming Interface (API) to assist and simplify 3270 application development for the personal computer programmer. The *IBM PC Emulation Program, Version 2.00, Application Programming Interface (API) and Host Reference Guide,* 59X9952 or 5C23-0892, is available for purchase from IBM.

The IBM PC 3270 Emulation Program Version 2.00 is compatible with TopView 1.10 and provides the 3270 emulation user with the TopView 1.10 multitasking and windowing capability. This allows the user access to the copy/paste facility between TopView 1.10 windows, and includes full support for the IBM PC LAN Program 1.10 - TopView Messenger Program. The PC-DOS Alternate Partition capability available with the IBM PC 3270 Emulation Program, Version 2.00 is not available under TopView 1.10. For those users/developers intending to use the IBM PC 3270 Emulation Program running under a TopView window, the IBM TopView Programmer's Tool Kit, 1502483, is also available for purchase from IBM.

IBM PC 3270 Emulation Program Version 2.00 supports programs developed using the IBM Graphics Development Tool Kit Version 1.10 Virtual Device Interface (VDI). Version 2.00 also supports access to IBM S/370 resources for office functions via support for Personal Services/PC. This provides personal computer users access to IBM Distributed Office Systems Services (DISOSS) and support of PROFS/PC.

In addition to the SDLC Adapter for SNA connections for up to 32 sessions, host connectivity has been enhanced to support connection to an IBM host system through the IBM 3278/79 Emulation Adapter with up to 5 sessions for both SNA and non-SNA (excluding BSC) connections. The 3278/79 Emulation Adapter provides connection not only to a 3274 Control Unit local channel attached (Model 31A or above) or remotely attached (Model 31C or above) to a S/370 host for SNA support but also to an IBM 3274 Control Unit locally (Model 31D or above) attached to a S/370 host for non-SNA support.

With the IBM PC 3270 Emulation Program, users can access the resources of both the IBM Personal Computer and an IBM S/370 system. If this emulating PC is used as a gateway on an IBM PC Network or IBM Token Ring Network, it can support up to 32 simultaneous users connected to a host system via the SDLC connection on the gateway system; it can support up to five simultaneous users connected through the DFT configuration using the 3278/79 Emulation Card. Each PC requiring 3270 emulation needs the IBM PC 3270 Emulation Program and the appropriate network hardware. The IBM PC 3270 Emulation Program Version 2.00 is fully compatible with the IBM PC LAN Program Version 1.10. This includes the redirector, receiver, messenger and server configurations. Both programs support t he IBM PC Network or the IBM Token-Ring Network.

Supported Workstation Configurations

The IBM PC 3270 Emulation Program, when installed on an IBM PC, PC XT, *Portable* Personal Computer or Personal Computer AT, provides capabilities in the following four configurations:

Standalone is a single IBM PC attached to a host computer by way of an SNA/SDLC line or coaxial cable attached as a Distributed Function Terminal (DFT) to a 3274 Control Unit. The SNA/SDLC configuration emulates a subset of IBM 3274-51C Control Unit functions, 3278 Model 2 or 3279 S2A display station functions, and/or 3287 Model 1 or 3287 Model 2 printer functions. The DFT configuration allows the PC to emulate a 3278 Model 2 or 3279 Model S2A display station functions, and/or 3287 Model 1 or 3287 Model 2 printer functions.

Gateway is an IBM PC functioning as a communications server for PCs that are attached to an IBM PC Network or IBM Token-Ring Network.

When the Gateway is attached to the host via SNA/SDLC, this configuration emulates a subset of IBM 3274-51C Control Unit functions.

When the Gateway is attached to the host via DFT, the Gateway attaches to the 3274 Control Unit and uses the DFT Multiple Interactive Screen capability.

The Gateway serves users as a connection to a host computer for up to 32 concurrent IBM PC 3270 Emulation sessions if you are using SDLC communications attach and five concurrent sessions for DFT communications attach.

Multiple Gateways can be attached to IBM PC Network or IBM Token-Ring Network, thereby providing communications with one or more IBM host computers.

Network Station is a communications user that is attached to an IBM PC Network or IBM Token-Ring Network and uses a Gateway to access a host. This configuration emulates a subset of IBM 3278-2 or 3279-S2A display station functions and optional 3287-1 or 3287-2 printer functions.

Gateway with Network Station is an IBM PC functioning as a communication server for PCs that are attached to an IBM PC Network or IBM Token Ring Network, as well as having full function network station capabilities. In this configuration, the PC emulates a subset of 3274-52C Control Unit functions, 3278 or 3279 display functions, and 3287 printer function.

Upgrading Requirements

A list of new IBM PC 3270 Emulation Program functions that were not available with the IBM PC Network SNA 3270 Emulation Program follows, along with a description of the upgrading requirements associated with each new function:

- DFT support:

  If a user wants to upgrade to this release of IBM PC 3270 Emulation and use DFT attachment, all workstations must be upgraded with the new IBM PC 3270 Emulation Program, and the Gateway or Standalone PC must be upgraded with the associated hardware.

- API support:

  Any user wanting to use the API must upgrade to this release of IBM PC 3270 Emulation. Any configuration, except the dedicated Gateway, can use the API, and each IBM PC can be upgraded individually with no requirements for other IBM PC workstations.

- Reduced Memory Requirements for the Gateway: The Gateway can now support more than eight display and printer sessions without requiring additional memory. The Gateway or Gateway with Network Station may be upgraded individually without any requirements for other PC workstations.

- IBM TopView 1.10 and IBM Graphics Development Tool Kit Version 1.10 support:

  Each workstation can be upgraded individually to support either of these new products.

- Upgraded IBM PC LAN Program 1.10 compatibility:

  An IBM PC 3270 Emulation Network Station is now compatible beyond the redirector configuration of the IBM PC LAN. Program. To take advantage of the enhanced compatibility between IBM PC 3270 Emulation Program and IBM PC LAN Program, all machines that will be using the PC LAN Program must be upgraded to use the new release and version of both programs.

Hardware Requirements

Every IBM PC, IBM PC XT, IBM *Portable* PC or IBM PC AT with the IBM PC 3270 Emulation Program installed must have at least one dual-sided diskette drive. In addition, an IBM PC using the IBM PC 3270 Emulation Program requires the following:

As a Standalone station:

- One of the following adapters:
  - IBM SDLC Adapter, P/N 1502090, for line speeds up to 4.8K bps
  - IBM SDLC Adapter, P/N 1501205, for line speeds up to 19.2K bps
  - IBM 3278/79 Emulation Adapter, P/N 1602507, for DFT attachment
- An IBM PC DOS Program, Version 2.10 through 3.20.

As a Gateway or Gateway with Network Station on an IBM PC Network or IBM Token-Ring Network:

- One of the following communications adapters:
  - IBM SDLC Adapter, P/N 1502090, for line speeds up to 4.8K bps
  - IBM SDLC Adapter, P/N 1501205, for line speeds up to 19.2K bps
  - IBM 3278/79 Emulation Adapter, P/N 1602507, for DFT attachment

- One of the following network adapters:
  - IBM PC Network Adapter, P/N 6540213
  - IBM Token-Ring Network PC Adapter, P/N 6339100
- IBM Token-Ring Network NETBIOS Program, P/N 6467037 (required only if using the Token-Ring Network PC Adapter)
- An IBM PC DOS Program, Version 2.10 through 3.20 (3.20 is required if using the Token-Ring Network NETBIOS Program and Network PC Adapter)

As a Network Station providing 3270 emulation:

- One of the following network adapters:
  - IBM PC Network Adapter, P/N 6540213
  - IBM Token-Ring Network PC Adapter, P/N 6339100
- IBM Token-Ring Network NETBIOS Program, P/N 6467037 (required only if using the Token-Ring Network PC Adapter).
- An IBM PC DOS Program, version 2.10 through 3.20 (3.20 is required if using the Token-Ring Network NETBIOS Program and Network PC Adapter).

Hardware Supported

The display and display adapter cards that are supported by IBM PC 3270 Emulation are:

5151-001 IBM Monochrome Display

4900 IBM Monochrome Display and Printer Adapter

5153-001 IBM Color Display

4910 IBM Color/Graphics Monitor Adapter

5154-001 IBM Enhanced Color Display

1200 IBM Enhanced Graphics Adapter

BIOS Video Modes 0 through 7 are fully supported for the IBM Monochrome Display Adapter and for the IBM Color/Graphics Monitor Adapter. BIOS Video modes 0 through 5 and 7 are supported for the IBM Enhanced Graphics Adapter. While an Alternate Task is using a BIOS Video Mode other than mentioned above, the Alt Task key is disabled and a beep will sound if you press the Alt Task key.

IBM PC 3270 Emulation provides no support for switching between displays by using the IBM PC DOS MODE command in the Alternate Field.

Refer to the appropriate *Technical Reference* manual for further information on BIOS Video Modes.

Printers Supported

IBM PC 3270 Emulation supports the following IBM printers:

- Graphics Printer
- Color Printer
- Quietwriter, Models 1 and 2
- Wheelprinter
- Wheelprinter E, Model 1
- Colorjet Printer
- Pageprinter
- Proprinter

Printers that use the Asynchronous (Async) port cannot be used on the Gateway, Gateway with Network Station and Standalone configurations that are attached using an SDLC Card.

To use these printers on the Network Station, the Async port should be jumpered to use interrupt level 4, and the IBM PC Network or IBM Token-Ring Network PC Adapter should be jumpered to use level 3.

DFT Attachment Protocols Supported

- **Local/Remote SNA.** Local SNA requires 3274 models 31A or above (31A, 41A and so on), configuration support D. Remote SNA requires 3274 models 31C or above, configuration support D. The maximum RU size is 1024.
- **Local Channel Non-SNA.** Local Channel Non-SNA requires 3274 model 31D or above, configuration support D.
- **Remote BSC is not supported.**

Note—3274 Control Unit microcode (software), Release 65.0 or higher, is required with the IBM PC 3270 Emulation Program.

IBM Graphics Development Toolkit Version 1.10

The IBM Graphics Development Toolkit Version 1.10 provides graphics support for IBM language compilers through an implementation of the Virtual Device Interface (VDI), a device-independent application programming interface. VDI is a powerful and flexible tool for graphics programmers and application developers. Application developers can use the VDI to create graphics applications independent of hardware resolutions.

A key concept of the VDI is application independence from the resolution of specific hardware devices. The VDI accomplishes device independence by defining the display surface of each device as the Virtual Device Coordinates (VDC) space of the application. The VDC space of all VDI devices starts with 0, 0 in the lower left corner with maximum X and Y axis values of 32767.

This coordinate transformation allows an application to take advantage of the maximum resolution for each device without concern for the hardware resolution. The VDI also provides a raster coordinate mode. This mode lets applications bypass the transformation modes of the VDC and address physical hardware coordinates.

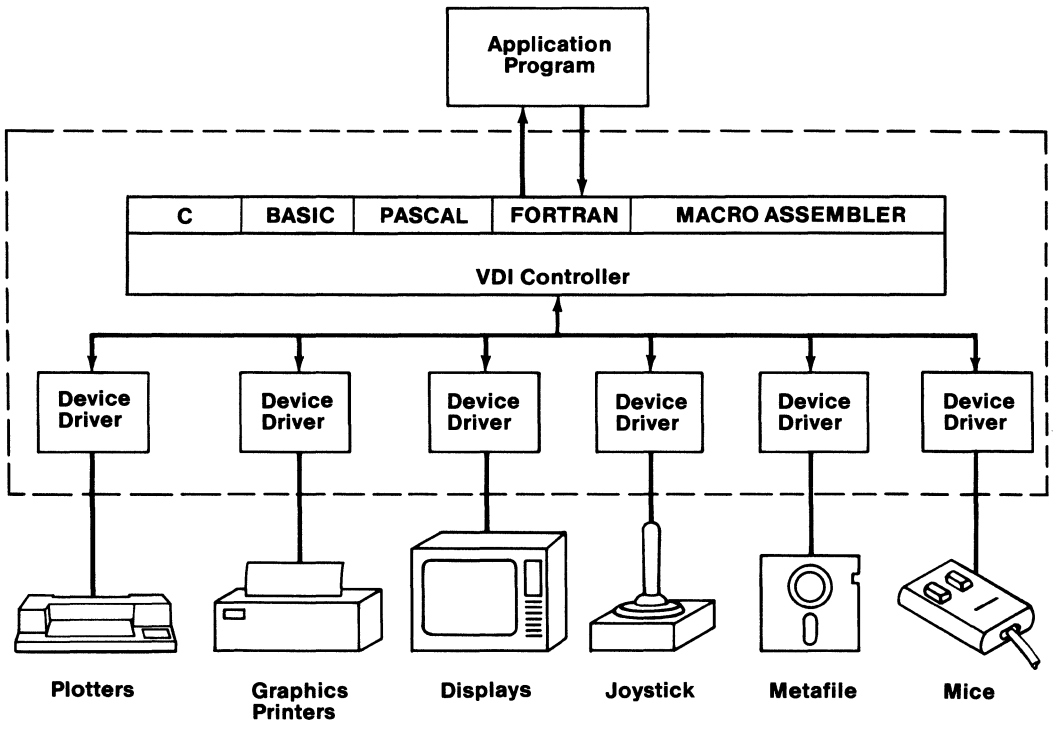

Figure 2. **IBM Graphics Development Toolkit Virtual Device Interface**

New Features of IBM Graphics Development Toolkit Version 1.10

IBM Graphics Development Toolkit Version 1.10 includes all the functions in Version 1.00. New features include:

- Improved performance
- Additional support for raster graphics
- Coexistence with TopView 1.10.

In addition, over 40 new functions have been added to the Virtual Device Interface and some Version 1.00 functions have been enhanced.

Performance Improvements

The IBM Graphics Development Toolkit Version 1.10 has a number of performance improvements. These include:

- IBM Color/Graphics Adapter and IBM Enhanced Graphics Adapter device drivers that are 3 to 5 times faster than Version 1.00 device drivers.
- IBM Color Printer, Graphics Printer and Proprinter device drivers that are more than 1.25 times faster than Version 1.00 device drivers.

Performance improvements were determined by comparing the time required to output basic graphics functions using Version 1.10 to the time required using Version 1.00. These basic functions include writing graphics (APA) text, line drawing, raster copies, and area fills of crosshatches and line drawing.

Coexistence With TopView Version 1.10

An application developed with IBM Graphics Development Toolkit Version 1.10 will run under TopView 1.10 as a nonwindowed application. Applications developed with IBM Graphics Development Toolkit Version 1.10 and using the VDI 1.10 input functions can share the same mouse as TopView 1.10. This is accomplished by selecting the TopView Logical Mouse as the VDI input device.

New and Enhanced Functions

Over 40 new functions have been added to the IBM Graphics Development Toolkit Version 1.10. The new and enhanced functions include:

- **Elliptical Drawing Primitives**
  - **Output Ellipse, Output Elliptical Arc, and Output Elliptical Pie Slice** are new functions that display elliptical drawings using the selected pattern fills, hatch, or user-definable fill patterns.
- **Clipping Functions**
  - **Set Clip Rectangle** limits graphics primitives to a sub-region of the display. Any graphics that are attempted to be displayed outside of the clip rectangle will not be displayed.
  - **Inquire Clip Rectangle** provides an application the current or default clip rectangle.
- **Bitmap Functions**
  - **Create Bitmap** makes a virtual off-screen bitmap and initializes the bitmap to the background color.
  - **Select Bitmap** selects a bitmap as the destination of subsequent graphics output functions.
  - **Copy Bitmap** copies a rectangular sub-region of one bitmap into another bitmap rectangular region.
  - **Inquire Optimum Pattern Size** provides the application with the optimum pattern size for fills and lines.
- **Pixel Arrays**
  - **Output Pixel Arrays** (integer and byte format) displays pixel information independent of the hardware.
  - **Inquire Pixel Arrays** (integer and byte format) reads pixel information independent of the hardware.
- **Input Functions**
  - **Select Graphic Input Cursor** allows an application to select a crosshair, arrow, checkmark, pointing hand, palm of hand, hourglass or a user-definable cursor.
  - **Create Cursor** allows the application to create a cursor.

- **Inquire Cursor Description** returns a description of the user-defined cursor to the application.
- **Read Cursor Movement Keys** determines the type of key pressed and returns the direction of the cursor movement to the application.
- **Input Locator (sample mode)** provides information about any movement of the input device, such as a mouse movement, to the application.
- **Delete Cursor** removes the cursor created by the application.

- **Input Extent**
  - **Set Input Extent** limits and scales the coordinations of the input device.
  - **Inquire Input Extent** provides the current coordinate limit of an input device to the application.

- **Graphics Functions**
  - **Inquire and Set Polyline Line Representation** functions are used by applications to save and restore the polyline representation in bundles for easy transfer between common routines.
  - **Inquire and Set Polymarker Representation** functions are used by applications to save and restore the polymarker representation in bundles for easy transfer between common routines.
  - **Inquire and Set Fill Area Representation** functions are used by applications to save and restore the fill area representation in bundles for easy transfer between common routines.
  - **Set Color Table** is used to set the Color Table in a single call.
  - **Set Background Mode** allows an application to choose between opaque or transparent background pixels during graphics operations. An opaque background is commonly used when overlaying graphics figures with text.
  - **Set Polyline Line Type** sets the line style that is defined by the application as any dash pattern with up to 32 dots and dashes.
  - **Set Polyline Line Cross Section** selects the pattern used to fill thick lines.
  - **Set Graphic Text Alignment** sets the text alignment point for subsequent graphics text.
  - **Set Graphic Text Representation** sets all of the application graphics text attributes, such as font, color, alignment, size and baseline rotation.
  - **Inquire Graphics Text Extent** provides the text alignment points to the application. The application can use these alignment points to more easily concatenate text.

Compatibility

IBM Graphics Development Toolkit Version 1.10 is functionally upward compatible with IBM Graphics Development Toolkit Version 1.00. All Version 1.00 device drivers will work with the Version 1.10 controller. Any Version 1.00 .EXE program will run with Version 1.10.

Devices Supported

The Graphics Development Toolkit provides device drivers that allow specific graphics devices to function in the VDI-based application. The Graphics Development Toolkit Version 1.10 provides device drivers for the following devices:

- IBM Color/Graphics Adapter
  - High Resolution 640 by 200 / 2 colors (VDIDY006.SYS)
  - Medium Resolution 320 by 200 / 4 colors (VDIDY004.SYS)
- IBM Enhanced Graphics Adapter
  - Color Display 640 by 200 / 16 colors (VDIDY00E.SYS)
  - Color Display 320 by 200 / 16 colors (VDIDY00D.SYS)
  - Enhanced Color Display 640 by 350 / 16 colors (VDIDY010.SYS)
  - Monochrome Display 640 by 350 / 4 colors (VDIDY00F.SYS)
- IBM Color Printer
- IBM Compact Printer (Version 1.00 functions)

- IBM Game Adapter with Joystick
- IBM Graphics Printer
- IBM PC*jr* Display (Version 1.00 functions)
- IBM Proprinter
- IBM Virtual Device Metafile (VDM) (Version 1.00 functions)
- IBM 7371 Two-Pen Plotter
- IBM 7372 Six-Pen Plotter
- Mouse Pointing Devices
  - Microsoft® Mouse for IBM Personal Computers (Parallel Interface)[5]
  - Microsoft® Mouse for IBM Personal Computers (Serial Interface)
  - PC Mouse™ by Mouse Systems (Serial Interface)[6]
  - Visi On™ (Serial Interface)[7]

Language Libraries

Applications that use the VDI must interface to the VDI Controller and device drivers using a set of language libraries. The Graphics Development Toolkit Version 1.10 supports the following languages:

- IBM Personal Computer Macro Assembler (Versions 1.00 and 2.00)
- IBM Personal Computer FORTRAN 2.00 (VDI Version 1.00 functions only)
- IBM Personal Computer Professional FORTRAN
- IBM Personal Computer BASIC Compiler (Versions 1.00 and 2.00)
- IBM Personal Computer Pascal Compiler 2.00
- IBM Personal Computer C Compiler
- Lattice® C Compiler Version 2.12[8]

Additional Features

The Graphics Development Toolkit Version 1.10 includes sample programs written in each supported language. Also supplied is an interactive demonstration program that illustrates the bitmap functions, new graphics cursors, clipping rectangles, pixel array functions and many other VDI functions. The demonstration program shows pop-up windows, smooth text scrolling, color table swapping and animation. The demonstration program also includes an interactive graphics editor that uses the new input function of the VDI and displays some of the VDI graphics primitives. The demonstration program was coded in C and the source files are included with the Graphics Development Toolkit Version 1.10.

Hardware Requirements

- An IBM Personal Computer, IBM Personal Computer XT, IBM *Portable* Personal Computer, IBM PC*jr*, or IBM Personal Computer AT.
- A minimum of 128KB of memory (256KB or more is recommended).

  Note—The interactive demonstration program requires 512KB of memory.
- A 360KB diskette drive (360KB or 1.2MB diskette drives for the IBM Personal Computer AT)
- A display and appropriate graphics adapter.

5 Microsoft is a registered trademark of Microsoft Corporation.
6 PC Mouse is a trademark of Metagraphics/Mouse Systems.
7 Visi On is a trademark of VisiCorp.
8 Lattice is a registered trademark of Lattice, Inc.

IBM PC Disk Operating System (DOS) Version 3.20

The IBM Personal Computer Disk Operating System (DOS) provides the vital link between hardware and software on the IBM Personal Computer. It serves as an operating base for a large number of existing software applications, and a productivity tool for the development of programs.

DOS provides the ability to easily manage files on a disk or diskette and to interface with other devices. DOS allows the chaining of commands to produce a sequence of programs and permits a program or series of programs to begin automatically upon power on or restart.

Included with DOS are a Line Editor, a Debug utility, a Linker Program, Disk BASIC, and Advanced BASIC. The Line Editor can be used to create, display, or change source files. The Debug utility can be used to display, change, or trace a program in memory. The Linker Program can be used to combine separately produced object modules into a relocatable load module.

DOS provides the I/O interface for Disk and Advanced BASIC, the IBM Personal Computer BASIC Compiler, C Compiler, COBOL Compiler, FORTRAN Compiler, Pascal Compiler, APL and Macro Assembler.

New Features of IBM DOS Version 3.20

DOS 3.20 supersedes DOS 3.10 and contains all the function of previous versions of DOS. Highlights of the new function available in DOS 3.20 are as follows:

- 3.5" Diskette Drive Support

  Provides full support for 720KB (3.5") diskette drives. This includes the normal DOS commands for managing and using diskettes as well as defining a physical device as two logical devices.

- Support for IBM PC Convertible

  System Wait is a BIOS function provided to conserve battery power on the IBM PC Convertible. This would be invoked when a long external event delay (such as waiting for a keystroke) is taking place. During this time, clocking of the CPU is inhibited to conserve battery power.

  Diskette change line support is provided for the IBM PC Convertible similar to the IBM Personal Computer AT. This function detects that a diskette door has been opened and the diskette may have been changed.

  The Graphics program has been enhanced to support the IBM PC Convertible Liquid Crystal Display and the IBM PC Convertible Printer.

- Expandable DOS environment area

  A new option of the SHELL command allows this area to be expanded to 32KB. This allows the user to specify more extensive PATH, PROMPT and SET commands without running out of environment space.

- New and enhanced commands

  The FORMAT Command now requires the user to specify the drive letter; it no longer uses the current drive as the default. When formatting a fixed disk, the FORMAT command requires the user to specify the volume ID of the disk. A warning message is also displayed indicating that all data on the fixed disk will be lost if the user chooses to proceed with the formatting.

  REPLACE is a new command that replaces all occurrences of a file on a disk. This facilitates installing new versions of DOS or application programs.

  The SELECT command has been enhanced to provide additional flexibility.

  XCOPY allows the user to copy files in more than one subdirectory. Options allow prompting for selective copying of the files, verify after write, copying of lower level directories even when empty, copying of files modified after a specific date, copying of archived files only (with or without modifying the archive bit). XCOPY can be performed where the source and target drives are of different densities.

- Utilization of the BIOS Parameter Block (BPB)

  The BIOS Parameter Block is used to obtain media type information. This is a step to remove the dependency on the File Allocation Table (FAT) ID for the media type information.

- IOCTL Subfunctions

  DOS 3.20 implements subfunctions that enhance device independence. These subfunctions allow querying and changing of device parameters as well as logical device support. The subfunctions included are:

  - Get Device Parameters
  - Set Device Parameters
  - Read Track on Logical Drive
  - Write Track on Logical Drive
  - Format and Verify Track on Logical Drive
  - Verify Track on Logical Drive
  - Get Logical Device Number - determine if device has more than one letter
  - Set Logical Device Number - suppress diskette change request message.

Memory Requirements

Because DOS 3.20 requires more memory than previous versions of DOS, some programs may not fit in the same size machine. In these cases, a program may be divided into smaller segments, or more memory may be added to the system unit:

DOS 2.10	24KB
DOS 3.00/3.10	36KB
DOS 3.20	44KB

The following are the memory requirements for DOS 3.20:

- IBM PC*jr* - 128KB
- IBM Personal Computer - 96KB (128KB recommended for a fixed disk)
- IBM Personal Computer XT - 128KB
- IBM *Portable* Personal Computer - 256KB
- IBM Personal Computer AT - 256KB

Packaging

DOS 3.20 is available in both 5.25" and 3.5" media:

- 6280057 - IBM Personal Computer DOS Version 3.20 (5.25"), two 5.25" double-sided diskettes (360KB)
- 6280058 - IBM Personal Computer DOS Version 3.20 (3.5"), one 3.5" double-sided diskette (720KB)

The following publications are included with DOS 3.20:

- *IBM Personal Computer Disk Operating System User's Guide*
- *IBM Personal Computer Disk Operating System ~~Technical~~ Reference*
- IBM Personal Computer Disk Operating System Quick Reference Card
- Read This First Card
- Directory Response Card

The Enhanced Personal Computer Keyboard

Overview

The Enhanced Personal Computer Keyboard represents an advance in keyboard design for the IBM Personal Computer AT model 339 and the IBM Personal Computer (PC) XT models 089, 268 and 278. The Enhanced Personal Computer Keyboard is designed to meet the needs of a range of personal computer users, from the office system user to the user that communicates and interacts with larger computer systems. **The software developer should become familiar with the differences between the current keyboard and the Enhanced Personal Computer Keyboard that might affect programming.** These differences are documented in the *Technical Reference* manuals.

The Enhanced Personal Computer Keyboard has five sections:

- Typewriter Area
- Numeric Keypad
- Cursor/Screen Controls
- Function Keys
- Status Indicator Lights (only available on the IBM Personal Computer AT model 339)

The U.S. keyboard is arranged similarly to the Selectric®[1] keyboard layout, but with 47 graphic character keys. The Tab, CapsLock, Shift, Enter and Backspace keys have a larger striking area and are located in their familiar Selectric locations. One Control (Ctrl) and one Alternate (Alt) key is placed on each side of the space bar. The typing section and the numeric keypad have home row identifiers for the touch typist.

The typing section for the non-U.S. keyboard has a layout which meets the International Standards Organization (ISO) standard. It has 48 graphic character keys and a vertical enter key. An Alternate Graphic (AltGr) key on the right side of the space bar provides the ability to assign additional graphic characters to the keys.

The cursor and screen control keys have been separated from the numeric keypad. Therefore, the numeric keypad can be dedicated to numeric input. A division sign key and an additional Enter key have been added to the numeric keypad. Like the current IBM Personal Computer keyboards, the numeric keypad may also be used for cursor and screen control when not in NumLock mode.

The cursor control keys are arranged in the inverted "T" arrangement. Insert, Delete, Home, End, Page Up and Page Down keys are separated from the numeric keypad and located above the dedicated cursor control keys.

The function keys are located across the top of the keyboard in groups of four. The Escape key (ESC) is isolated at the upper left of the keyboard. Two additional function keys are provided, F11 and F12. Dedicated Print Screen/SysRq, Scroll Lock and Pause/Break keys are provided for commonly used functions.

Three status indicator lights are located at the upper right of the keyboard. These lights indicate the NumLock, CapsLock and Scroll Lock status of the keyboard. The lights are available only on the IBM Enhanced Personal Computer Keyboard, which connects to the IBM Personal Computer AT, model 339.

A microprocessor in the keyboard handles the system unit interface protocol, scan code generation and command processing.

1 Selectric is a registered trademark of IBM Corporation

Highlights

- 101-Key U.S. Version; 102-Key non-U.S. Version
- Recappable
- Selectric Typing Section for U.S. Version
- ISO Typing Section for non-U.S. Version
- Dedicated Numeric Keypad
- Dedicated Cursor and Screen Controls
- Twelve Function Keys
- Status Indicator Lights (only on the IBM Personal Computer AT)
- 9-Foot Cable
- U.S. and Five Language Support (U.K. English, French, German, Italian and Spanish)

The software developer should be aware that the data definitions at Port 60 have been changed to allow additional keys for cursor movement and control functions. Also, the interrupt 16 keyboard interface has been extended to allow identification of each keystroke.

Technical Reference manuals are available for purchase. These manuals are designed for the programmers, engineers and others who want to understand IBM Personal Computers in greater detail. The *Technical Reference Manual* or *Technical Reference Manual Update* that discusses the Enhanced Personal Computer Keyboard depend on the system unit to which the keyboard is attached:

- If an IBM Personal Computer XT
  - *Technical Reference Manual*, Part Number 6280089
- If an IBM Personal Computer AT
  - *Technical Reference Manual Update*, Part Number 6280099

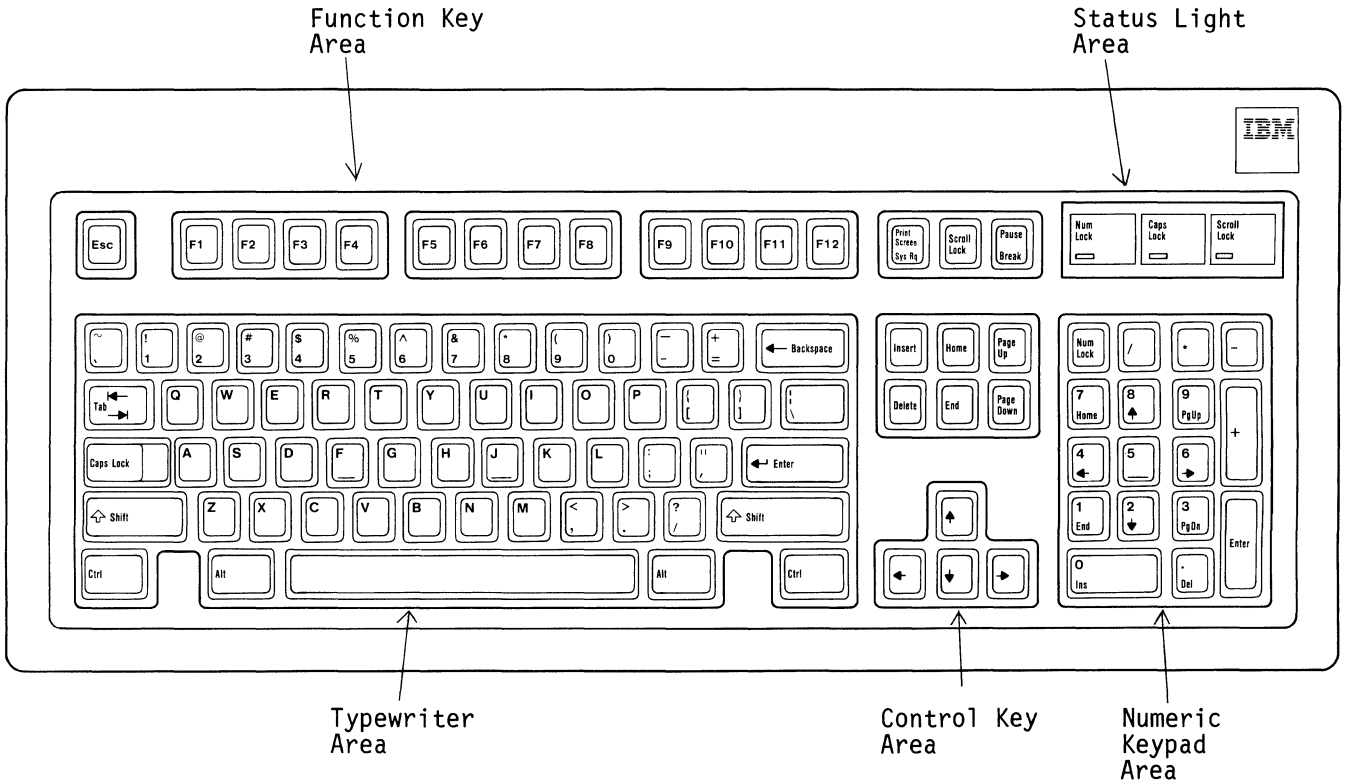

Figure 1. 101-Key U.S. Version Keyboard for the IBM Personal Computer AT model 339

IBM Personal Computer Seminar Proceedings

Publication Number	Volume	Topic
	V1.1	*Contains identical information as V1.2*
(G320-9307)	V1.2	IBM PC DOS 2.0 and 1.1 Comparison Compatibility Guidelines - Application Development 8087 Math Co-Processor IBM Macro Assembler
(G320-9308)	V1.3	IBM PC DOS 2.1 & Comparison to DOS 2.0 and 1.1 IBM PC*jr* Architecture & Compatibility Cartridge BASIC IBM Personal Communications Manager-Modem Drivers
(G320-9309)	V2.1	*Contains identical information as V2.2*
(G320-9310)	V2.2	IBM Software Support Center International Compatibility Requirements IBM Personal Computer Cluster Program
(G320-9311)	V2.3	IBM Personal Computer Cluster Program Sort, Version 1.00 FORTRAN and Pascal Compiler, Version 2.00 PC*jr* Cartridge Tips and Techniques
(G320-9312)	V2.4	IBM Personal Computer AT Architecture ROM BIOS Compatibility & Software Compatibility IBM PC DOS 3.0
(G320-9313)	V2.5	IBM PC Network Overview, Hardware & Program IBM PC Network BIOS (NETBIOS) Architecture
(G320-9314)	V2.6-1	TopView
(G320-9315)	V2.7	IBM Personal Computer Resident Debug Tool
(G320-9319)	V2.8-1	IBM PC Network SMB Protocol
(G320-9316)	V2.9	IBM Personal Computer XENIX, Version 1.00
(G320-9317)	V2.10	IBM PC Professional Graphics Software IBM PC Graphical Kernel & File Systems IBM Plotting System Library IBM Professional FORTRAN IBM PC Data Acquisition & Control Adapter & SW IBM General Purpose Interface Bus Adapter & SW
(G320-9318)	V2.11-1	IBM Enhanced Graphics Adapter
(G320-9320)	V3.1	IBM PC Information Panel (3295 Plasma Display)
(G320-9321)	V3.2	IBM BASIC Compiler 2.00
(G320-9322)	V3.3	IBM Personal Computer C Compiler
(G320-9323)	V3.4	IBM Asynchronous Communications Server Protocol
(G320-9324)	V3.5	IBM Personal Computer Voice Communications Option
(G320-9325)	V4.1	IBM Personal Computer XENIX, Version 2.00
(G320-9326)	V4.2	IBM Personal Computer System Extensions IBM Personal Computer Enhanced Keyboard

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