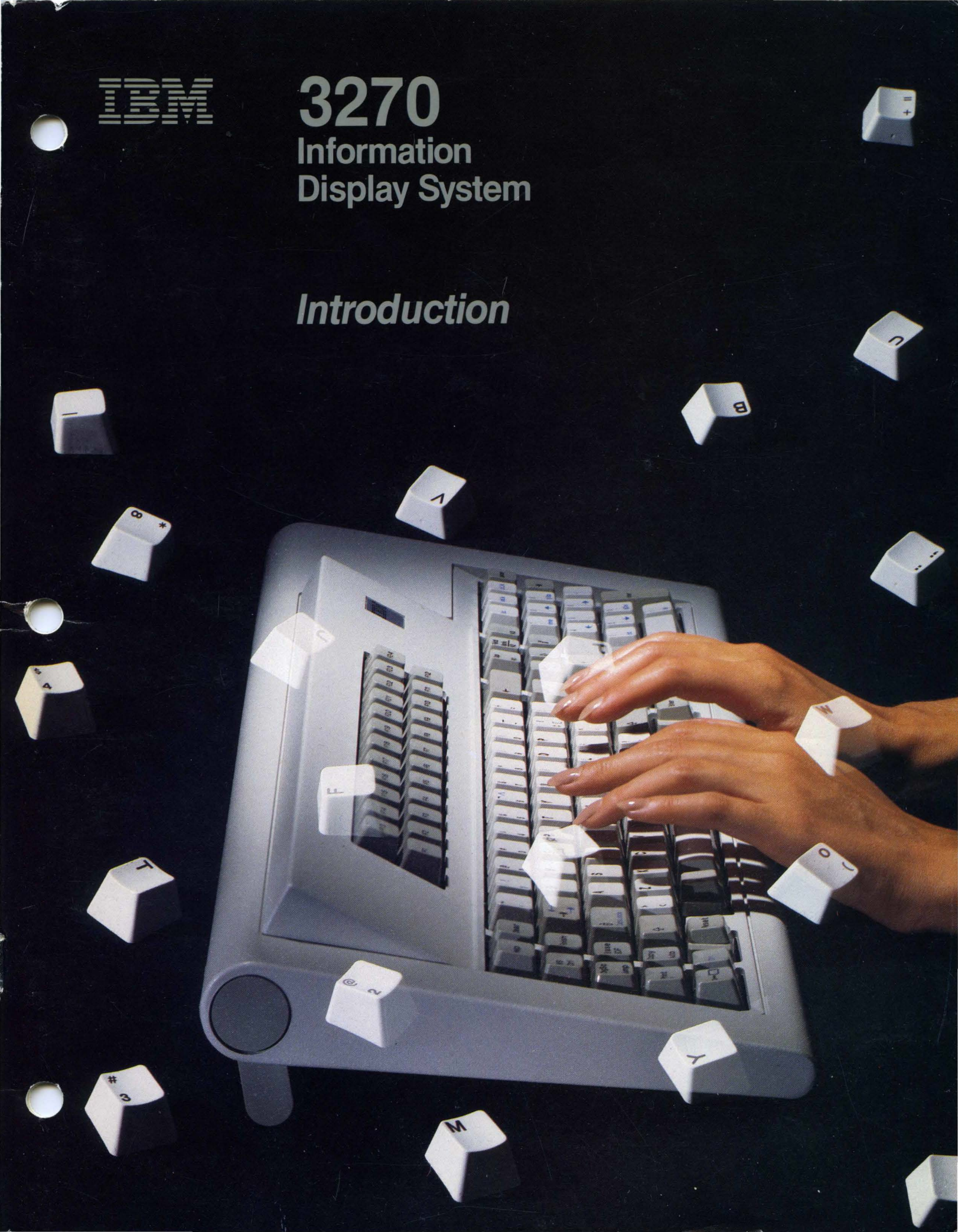
IBM

3270
Information Display System

Introduction



IBM

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Introduction

Nineteenth Edition (November 1984)

This is a major revision of, and makes obsolete, GA27-2739-17. This edition adds information about the 3270 Personal Computer/G and 3270 Personal Computer/GX graphics work stations, and the 4214 Printer.

Some illustrations in this publication represent design models and might not be exact replicas of production models.

Changes are made periodically to the information herein; before using this publication in connection with the operation of IBM systems, consult the latest *IBM System/370 and 4300 Processors Bibliography,* GC20-0001, for the editions that are applicable and current.

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Preface

This publication is written for those who have a basic understanding of display systems and their relation to a host computer. Anyone reading the chapters related to programming should understand an operating system and applications-related programming support for display systems. Customer executives and data processing managers, system analysts, programmers, and IBM marketing representatives and systems engineers will find introductory information about these IBM 3270 Information Display System products:

- 3274 Control Unit Models 21A, 21B, 21D, 31A, 31D, 41A, and 41D (local attachment)
- 3274 Control Unit Models 21C, 31C, 41C, 51C, and 61C (remote attachment, BSC or SDLC protocol)
- 3276 Control Unit Models 1, 2, 3, and 4 (remote attachment, BSC or SDLC protocol)
- 3276 Control Unit Display Station Models 11, 12, 13, and 14 (remote attachment, SDLC protocol)
- 3178 Display Station Models C1, C2, C3, and C4
- 3179 Color Display Station
- 3180 Display Station Model
- 3270 Personal Computer (3270-PC)
- 3270 Personal Computer/G (3270-PC/G)
- 3270 Personal Computer/GX (3270-PC/GX)
- 3277 Display Station Model 2
- 3278 Display Station Models 2, 2A, 3, 4, and 5
- 3279 Color Display Station Models S2A, S2B, S3G, 2C, 02X, and 03X
- 3290 Information Panel
- 3270 Personal Computer Attachment
- 3262 Line Printer Models 3 and 13
- 3268 Printer Models 2 and 2C
- 3287 Printer Models 1, 1C, 2, and 2C
- 3289 Line Printer Models 1 and 2
- 4214 Printer
- 4250 Printer
- 5210 Printer Models G01 and G02
- 3299 Terminal Multiplexer

Check with your IBM marketing representative for details about the IBM programming support available for your configuration.

Contents

Figures

Summary of Amendments

Nineteenth Edition (November 1984)

- Information has been added for:
  - The 3270 Personal Computer/G and 3270 Personal Computer/GX
  - The 4214 Printer
- Technical and editorial changes are made throughout the publication.

IBM 3279 Color Display Station: A Business Tool for the '80s

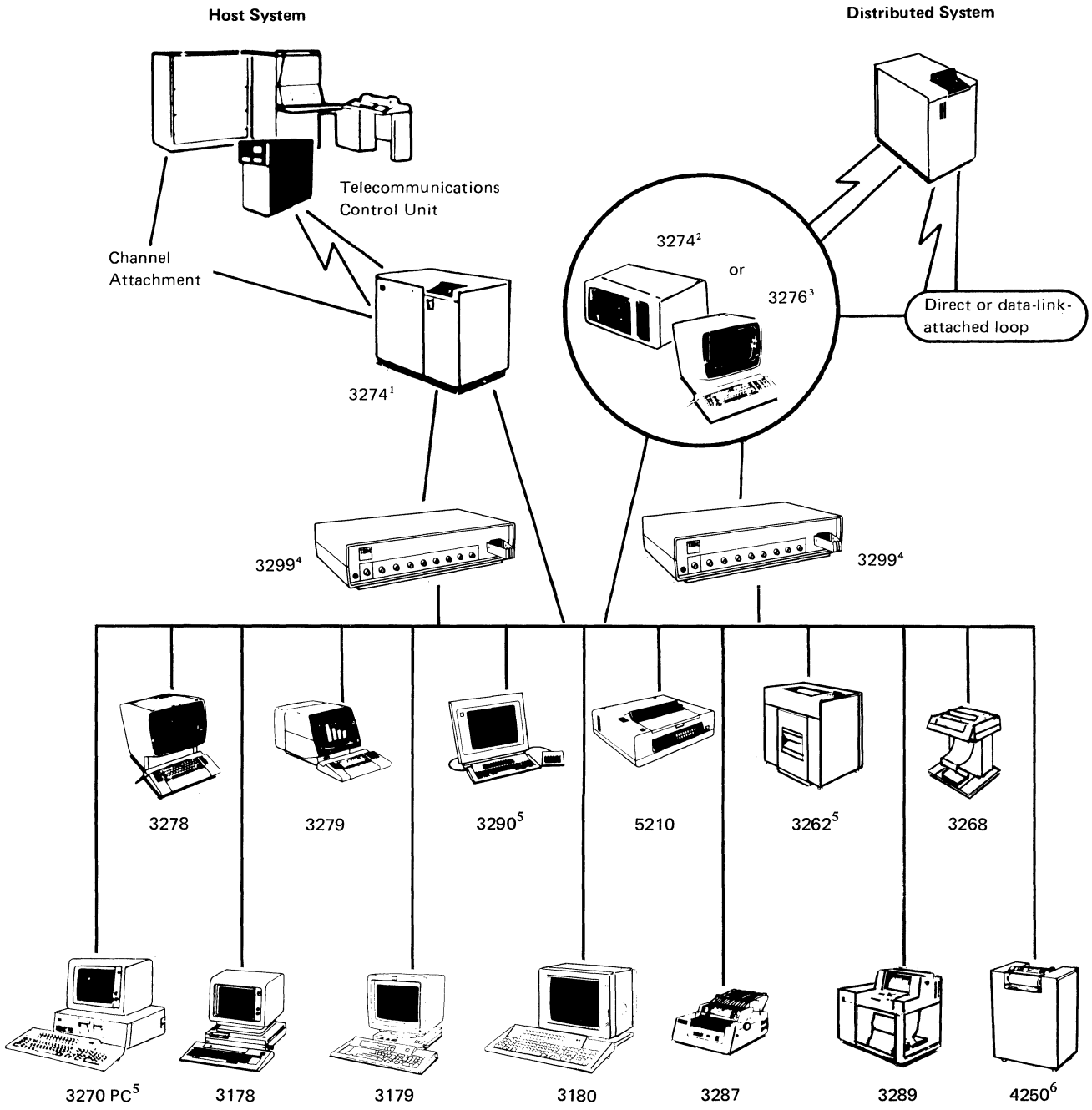
Chapter 1. Introduction

For developing, tracking, and sharing information, the IBM 3270 Information Display System is a business tool for the '80s. Its display terminals and keyboards can be used by people in many different roles — managerial, professional, secretarial, clerical, or data processing.

In the office, computer systems support administrative procedures. They offer word processing for correspondence, electronic message systems for person-to-person communications, teleconferencing services, online calendars, and links to corporate files and outside services.

In many businesses, customers call by telephone to check on the status of their accounts, or to check on the disposition of an order. The speed with which a display station can produce information means customer waiting time will be kept to a minimum. And for the display operator, obtaining that information from a computer file is a quick and simple job.

With a display system, people don't have to be near their files to use them. Miles away from the central computer, an operator can quickly and easily access files to read or update them. Because the host computer system is capable of processing different jobs at the same time, people sitting at adjacent terminals can be doing completely different work.



Legend:

Direct Connect

Communication Facility

[1] 3274 Models with up to 32 terminals: Models 21A, B, D; 31A, D; 41A, D (channel), and Models 21C, 31C, 41C (remote).

[2] 3274 Model 51C with up to 8 terminals, and 61C with up to 16 terminals.

[3] 3276 with up to 8 terminals.

[4] Up to 8 terminals on one 3299; does not attach to a 3274 Model 51C or to a 3276.

[5] The 3270 Personal Computer, 3290 and 3262 Model 3 do not attach to a 3276.

[6] The 4250 attaches only to 3274 Models 31A, D; 41A, D.

Figure 1-1. Overview of the IBM 3270 Information Display System Attachment

Components

The IBM 3270 Information Display System is a family of display products that can be configured together in a system: display stations with keyboards; printers; IBM personal computers; and control units. From a selection of components, you can tailor a computer system to fit your needs for the display of textual, numeric, and graphic material. The various models of each product have a full complement of standard features, so that configuring a system is a straightforward task. Special features for a particular model can be ordered easily. Figure 1-1 provides an overview of the components that can be attached in an IBM 3270 Information Display System.

Display stations give their operators quick access to data, stored in a computer, in a convenient form. The display image is clear, stable, and bright. To reduce glare, the display screens have either an etched surface or a filter bonded to their surface. Information or instructions are entered into the system at the **keyboard** connected to the display station. After being typed, each character immediately appears on the display screen. Using color, graphics, and special highlighting, the display station operator can create suitable formats for displaying data.

Printers are available in table-top models or as larger floor-standing units. They are distinguished by their printout: dot matrix or letter quality type. Models vary according to print rate, and certain models print in four colors.

The **control unit** links the display system to a central computer, or data processing system, called the "host." The control unit controls the operations of the display stations and printers attached to it. The component configuration can be a cluster of 32 (or fewer) display stations and printers linked to a separate control unit, or as simple as the Model 3276, a single integrated control unit display station.

The 3270 system was announced in 1971, and the new components that IBM introduces are designed to be compatible with earlier models.

Highlights of the 3270 System

The components in the 3270 system are an attractive addition to the office environment. They can be arranged to create individual work stations that make efficient use of available space.

Comfort is a key to productivity. The keyboards are angled for typing ease, and on some models the operator can adjust the angle. The display screens are designed to reduce glare, and on several models the screen can be tilted for more comfortable viewing.

The components in the IBM 3270 Information Display System each have unique features. Some of the highlights are:

Keyboards

- A selection of: typewriter, data entry, APL, text, attribute select, overlay, operator console, and modifiable keyboards.

Display Stations

- Screen formatting and editing
- A choice of typing only in uppercase, or mixed uppercase and lowercase letters
- An operator information area at the bottom of the display screen (outside the data area) to communicate the status of the terminal, cluster, or system to the operator
- Color capabilities
- Graphics capabilities
- Display highlighting:
  - Reverse video, to reverse the color of a character or field with the color of the screen background
  - Blinking of a character or field
  - Underscore of a character or field
- Programmed Symbols, a feature that allows an organization to define up to six character sets or fonts, to extend the range of special characters, symbols, or signs that can be displayed or printed
- Selector light pen and Cursor Select key to select certain fields of data on the display screen for the program to process
- A new generation of display stations, the 3270 Personal Computer and the 3290 Information Panel can display several screens simultaneously for viewing. The operator can move from one screen to another to work, and choose to make one or more of the viewing screens an area for copying from other screens.

Printers

- Dot matrix or letter quality printout
- Color printing capabilities
- Programmed Symbols, a feature that allows an organization to define up to six character sets or fonts, to extend the range of special characters, symbols, or signs that can be printed
- Underscore on color and monochrome printers

Cabling

- The 3299 Terminal Multiplexer provides significant cable savings when used to attach the 3274 Control Unit to its terminals.

Programming

- APL capabilities
- Personal Computer capabilities
- Graphics capabilities

Security

- A security keylock and an operator identification card
- A magnetic slot reader and magnetic hand scanner for entering magnetically encoded data
- Encryption/decryption capability so that data can be enciphered and deciphered between the host computer and the control unit

System Monitoring

- The Response Time Monitor feature is a means of accurately measuring, recording, and displaying end-user response time. The Response Time Monitor records the time lapse from when the operator presses the "enter" key until the host handles the data and returns it to the display screen. Gathering such information over a period of time produces response time statistics that are useful for network management and evaluation.

Programming Support

IBM has developed an array of operating systems, telecommunication access methods, and program products for the 3270 Information Display System. The programs, designed to meet clients' needs, cover such varied topics as financial management, personnel, trend analysis, document composition, graphic display, and airline control systems. Check with your IBM marketing representative for details on programming support available for the 3270 system.

Customer Setup

Certain components are designated as customer setup units, which offer advantages for the customer — early availability and greater flexibility in the installation and relocation of the components.

Problem Determination

The problem determination and recovery procedures designed for the operator to use with the 3270 units ensure that more computer time is available to the customer. The handy *Problem Determination Guide* included in most keyboards explains basic problems the user might encounter and suggests actions to take.

The alert function assists the system operator with network problem determination. This function enables the 3274 Control Unit to send error messages about problems in the system to the system operator. The operator can determine whether the alerts describe a particular type of error or errors on particular devices.

Chapter 2. Capabilities of the 3270 System

The 3270 system can be used with your application software for: inquiries, data or order entries, personal computing, document development, program development, and monitoring system activities. Versatile features such as color and programmed symbols used in these applications help you produce information in an attractive and useful format.

Inquiries

In a simple inquiry, the operator types a small input message — a name or account number — that elicits a short and quick output response, such as "yes" or "no". A credit house uses a simple inquiry application to determine whether a customer should be allowed to charge additional purchases.

In a complex inquiry, the operator types a small input message (up to 100 characters) that elicits a large output message (an entire screen or several screens of data). A credit house uses a complex inquiry application to get a complete credit history of a person who is trying to establish credit.

An inquiry can include a file update. The input message is again relatively small. The output message can be several screens of data, which the display operator modifies. A credit house uses this application when it records credit payments.

Data Entry

The 3270 Information Display System has a number of features that simplify data processing applications. The operator uses the keyboard, magnetic slot reader, or magnetic hand scanner, instead of conventional keypunch equipment, to enter data. When large amounts of data need to be entered, such as with payroll or inventory control, online key entry can be used to enter data that will be separately processed by an application program. The online key entry procedure is a highly productive and efficient method for copying large amounts of data. Editing tools help the operator verify that the data entered is correct. Formatted fields and protected data simplify and speed up the data entry.

With the magnetic hand scanner, the operator can read magnetic-stripe labels on shelves and cartons, and magnetic stripe-tags on badges and credit cards with the magnetic slot reader.

The display operator can enter data as formatted or unformatted entries. In an unformatted entry, the operator types in a customer's name and account number, and then types in an order: part number, quantity, price, and special instructions. The sequence in which the items are entered is important, but the location of the items on the screen is not. The data could be entered in one or two lines of type, or each item could be entered on a separate line.

In a formatted entry, the application program divides the screen into fields of data and defines the type of information to be displayed in each location (see Figure 2-1 for an example). Using a formatted screen to type in a sell-stock order, the operator would type data opposite the displayed labels.

Figure 2-1. An Example of a Formatted Entry

Depending on the application, the operator may take advantage of these capabilities to enter data:

Protected fields: In an application where certain information must be entered (such as renewal data for a driver's license, or a change of address), but where other information cannot be modified (driver's license number), the operator is prevented from entering data in the protected fields. A protected field is passed over by simply pressing the Tab key.

Special Keys: The operator can change unprotected alphanumeric data. There are special keys to change numeric-only data, or to erase the screen, a field, or characters in a field. The two edit keys, Insert and Delete, are used to change what has been typed.

Nondisplayed fields: If there are security restrictions on some parts of a file, the display operator can enter data in those fields without it being displayed or printed. To do this, the operator must type in a special password or ID for access to the data. This ID can also be typed in a nondisplayed field.

Highlighting: To help focus the operator's attention, selected data can be underscored, made to blink, or be displayed at brighter intensity or in reverse video. Programmed Symbols with different character sizes and fonts can be used to distinguish different categories of information. On a color display screen, color can accent different and related categories of information.

Personal Computing

With an IBM 3270 Information Display System, executives and managers have all the advantages of immediate access to information and the means to manipulate it. The applications can be as simple as information retrieval, corporate communications, and financial records — or as complex as "what if" scenarios. Executives can generate their own reports, plan and track the development of different divisions, send mail electronically, access public data bases, and use an automated calendar program to keep track of their schedules. Personal computing can be used for these tasks and more: planning, modeling, and simulation; financial and statistical analysis; mathematical, scientific, and engineering problem-solving; and econometrics.

Patterns of personal computing vary widely. One professional may use a single program package "as is," without any modifications. Another might write his or her own programs, using a programming language oriented for end users. Others may have a data processing department to develop an interactive program for them.

Document Development

With the software you select, the 3270 display stations can be used to write memos, letters, and reports, and maintain mail logs. The Entry Assist functions enable a display station to operate much like a power typewriter. Entry Assist simplifies page formatting and enhances existing editing capabilities.

Program Development

For programmers, the 3270 Information Display System provides interactive facilities for creating, compiling, testing, and updating programs. Interactive subsystems that provide program development facilities include the Conversational Monitor System (CMS) under VM/370, System Productivity Facility (SPF) under the time-sharing option (TSO), and Virtual Storage Personal Computing (VSPC) under multiple virtual storage (MVS). With these facilities, programmers at 3270 terminals can create, compile, test, and update programs. the 3290 Information Panel offers large screen and split screen options that can improve programmer productivity.

Monitoring System Operation

A display screen can hold many system messages and display them faster than a keyboard printer. You can use the display station to control system operations by entering data into the system and receiving it from the system. If used only to monitor system operation, the screen displays the status or operator messages but no data is entered into the system.

Color Applications

Because data presented in color is easier to separate visually, it is easier to understand. Base color —four colors—is provided on a field basis. Extended color—seven colors —is available on a field and character basis. Using a color display or printer, you can create distinctions that speed recognition of particular fields of data. Color facilitates these tasks:

Distinguishing data sources: Differentiating data that has been entered at the keyboard, data that has been program generated, data that is held on file, messages from the host computer, and so on.

Distinguishing data types: Differentiating headings, field names, data as originally entered, data entered and since changed, and instructions from the program.

Handling data codes: If the information displayed is categorized by a numeric code, about seven coded categories are the most that an operator can handle readily. If an additional categorization coded in color is introduced, the operator can handle a number of categories in each color.

Graphics

Pictures are an almost universal language, quickly comprehended. They convey information more directly than words, by the use of patterns, shapes, and colors. Converting numerical data into a graphic form makes it much more meaningful. Graphics can be used for:

Scheduling: Through a computer network, several offices, in different locations, can have simultaneous access to a graphic presentation of a complex schedule. Color enhances scheduling.

Process Monitoring and Control: You can use graphics to create a flow diagram indicating the status of a process or operation, such as any of the operations in chemical processing plants and oil refineries. Use of color assists the critically important interpretation of the data in such diagrams.

Graphic Arts and Publishing: Graphics, especially when augmented by color, have considerable potential in the fields of graphic design, composition, and illustration.

Computer-Assisted Instruction: Particularly when combined with color, graphics will improve the quality and effectiveness of computer-assisted instruction and online tutorial material.

Technical Data Analysis: Researchers and development professionals can present numeric information in graphic form to improve comprehension and productivity.

Business: You can create your own forms for payroll, billing, reports, and orders.

Engineering: Graphics are used for representation of data reduction and analysis, and for modeling and simulation in engineering applications.

Programmed Symbols: Alphanumeric and Graphic Applications

The Programmed Symbols feature allows you to store, under program control, up to six character sets or fonts which are defined by your organization. This extends the range of special characters, symbols, or signs that can be displayed or printed in the text. Programmed symbols are a standard function of some display stations; for other displays and printers, they are available as a special-order feature. The Attribute Select Overlay keyboard has special narrow key tops (in the 48-key data section) which can be overlaid with templates that have special font symbols whenever one of the programmed symbol sets is used. Programmed symbols can be defined as:

- Characters of different sizes
- Characters from foreign alphabets
- Mathematical signs and symbols
- Scientific signs and symbols
- Special type fonts, such as italic
- Shapes or picture components

When programmed symbols are defined as shapes or picture components, you can use them in combinations to create pictures on the screen or printed page.

Vector Graphics

With vector graphics available on certain 3270 Personal Computer work stations, complex graphics can be created and manipulated to suit a variety of host-interactive and personal computer applications. Graphics are drawn by a comprehensive set of vector graphic instructions such as line, arc, and image, and attributes such as color and line width. Drawing controls such as scaling—reducing or enlarging all or part of a picture, rotation—changing the orientation of all or part of a picture, and projection— obtaining a selected two-dimensional view of a three-dimensional object - allow graphics to be manipulated once they are created.

Vector processing handled by the work station instead of the host and an economical data stream combine to improve host performance and reduce the demands on the network and control units.

Security Enhancements

Security Keylock: A key can be used to disable the display station or printer (where available) whenever it is to be left unattended. The equipment can be used only when the proper key is inserted in the lock and turned to the ON position.

Magnetic Slot Reader (3278 and 3279 Displays): This accessory attaches to the display station with a cable and is used to send coded messages to the host system. For personal identification, magnetic-stripe tags and badges can be passed through a slot in the reader, which has three indicators and a buzzer that provide information on the status of the read data.

Magnetic Hand Scanner (3278 and 3279 Displays): This accessory attaches to the display station with a cable and, like the magnetic slot reader, can be used to read magnetic-stripe tags for security purposes. The scanner can read magnetic-stripe labels on objects, and magnetic-stripe tags that are hand-held or placed on a flat surface. Three lights and a buzzer provide information on the status of the read data.

Nondisplay Keying Mode: A program can define fields that will accept data entered from the keyboard but not display the data on the screen.

Address Keylock (3276 Control Unit Display): A key can open the Operator Panel Drawer to a position that exposes the address and transmit level switches (where installed.) When the drawer is locked, these switches are inaccessible.

Encryption/Decryption: When used with other IBM Cryptographic Subsystem products and operating in a network governed by a Systems Network Architecture (SNA)/Synchronous Data Link Control (SDLC), this feature permits transmission of encrypted data between the host computer and the 3274 Control Unit Models, 21C, 31C, 41C, 51C, and 61C, or the 3276 Control Unit Display Station Models 11, 12, 13, and 14, to prevent unauthorized disclosure and modification of the data, whether accidental or intentional.

Chapter 3. Display Stations

A 3270 display station combines the functions of your pen and paper, typewriter, and files all into one machine. As you type words, information, and instructions at the display keyboard, they appear on the display screen. Correspondence, reports, records, and data bases can all be filed away, and then called back up to screen and modified whenever necessary. Using interactive programs, you can also do planning, modeling, simulations, and statistical and financial analysis at a display station.

The 3270 display stations vary in their physical design, yet they follow the same architecture and share a common data stream format. Their screens differ in size, and the size of the characters and the space between the lines of type can vary with the display.

The color of the characters and the background screen also depends on the display device:

- Green characters on a black background (3178, 3180, 3277, 3278)
- A choice of colored characters on a black background (3179, 3279)
- Orange characters on a black background (3290)
- A choice of eight colors for both characters and backgrounds (the color monitor of a 3270 Personal Computer)

3270 display station images are clear and stable. On some models, the brightness can be adjusted. To help reduce glare, the display screens have either an etched surface or a filter bonded to their surface.

IBM 3179 Color Display Station

3179 Color Display Station

The 3179 is a compact, lightweight, seven color display station emphasizing low price and ease-of-use. The Typewriter Keyboard layout has 122 keys, including 24 individual PF keys plus a numeric keypad in adding machine layout. Data is displayed on a screen that holds 1920 characters (24 rows with 80 characters in each row).

The modifiable keyboard is a feature that can be used when the 3179 is attached to selected models of the 3274 Control Unit. By modifying the keyboard tables in the 3274, the user can create uniquely defined keyboard layouts. Removable keycaps may then be moved about on the keyboard to reflect the changes made to the keyboard tables. (See Keyboard Definition Utility on page 4-7).

Base color for the 3179 display station is four colors—red, blue, green, and white, provided on a field basis. Extended color is seven colors—red, blue, green, white, yellow, turquoise, and pink, available on a field and character basis.

An unmodified version of the keyboard can operate in emulation mode (similar to a 3178, 3278, or 3279 keyboard), to be compatible with application programs written for those displays.

Three separate machine elements make up the 3179 color display station: the video, logic, and keyboard elements. Designed for customer comfort, the 3179 display has a moveable keyboard with an adjustable inclination angle. Tilt and swivel are standard for the video pedestal. Automatic color convergence produces bright, crisp colors. Light reflections and smudges are reduced by an enhanced-contrast display screen producing sharp, clear images. These replaceable work station elements offer the operator easier problem analysis.

Additional 3179 features include:

- Plug compatibility with all IBM 3279 model S2A and S2B displays, and with 3279 model 2A, 2B, and 02X displays with comparable function.
- Audible alarm and security keylock.
- A monocase switch for switching to uppercase alphanumeric mode.
- Support for ASCII requirements.
- An optional (accessory) two-way switch allows the user to switch from one control unit to another.

The 3179 Color Display Station is supported by existing 3270 programming systems and application programs, and no changes are required in the current programs written for the 3279 Models S2A and S2B with equivalent function. No programming changes are needed for 1920-character, 3178s and 3278s with standard functions.

The 3179 attaches to the 3274 Control Unit, 3276 Control Unit Display Station, or a 4321 or 4331 Processor (via the Integrated Display Printer Adapter).

IBM 3180 Display Station

3180 Display Station (Model 1)

The 3180 display station emphasizes low price while providing multiple screen formats, advanced display functions (vertical scrolling, operator and program selectable screen formats, record/play function, modifiable keyboard), ease-of-use, and operator comfort. The adjustable display can be raised or lowered, tilted forward or backward, and turned to the right or left for viewing comfort. In addition, the standard 122-key, low-profile keyboard has adjustable height. The two types of keyboard layouts available for the Model 1 are Typewriter and Data Entry.

Four screen formats are available:

- Up to 1920 characters--24 rows of 80 characters each
- Up to 2560 characters--32 rows of 80 characters each
- Up to 3440 characters--43 rows of 80 characters each
- Up to 3564 characters--27 rows of 132 characters each

The modifiable keyboard is a feature that can be used when the 3180 is attached to selected models of the 3274 Control Unit. By modifying the keyboard tables in the 3274, the user can create uniquely defined keyboard layouts. Removable keycaps may then be moved about on the keyboard to reflect the changes made to the keyboard tables.

The record/play function makes repetitive keying easier. A series of up to 97 keystrokes can be "saved" in the 3180 via a program function key. Upon command, the "saved" data can be recalled. The recorded data will be retained when power is turned off. Also, the automatic display dim function dims the screen if there is no keystroke activity for 10 minutes.

The 3180 consists of five work station elements:

- Display
- Logic
- Keyboard
- Cable attachment module
- Power cord

Any one element can be individually replaced, making problem analysis easier.

Additional 3180 capabilities include:

- 3278 Models 2 through 5 screen formats and compatible functions.
- Extended highlighting
- Monocase switch for dual or monocase character selection.
- Local copy
- Keyboard numeric lock
- Cursor position indicator
- Adjustable audible alarm
- Security keylock
- An optional (accessory) two-way switch allows the user to switch from one control unit to another.

The 3180 Display Station attaches to the 3274 Control Unit, 3276 Control Unit Display Station, or the 4300 Processors.

IBM 3270 Personal Computer

3270 Personal Computer

With the IBM 3270 Personal Computer (3270-PC), the user can arrange the screen into as many as seven smaller windows of various sizes. One personal computer session, up to four host sessions, and up to two notepad sessions can be displayed at one time. A notepad session can be used for jotting down online notes while the user works in a host or personal computer session. The user operates in one session at a time, using the same keyboard for each one. Moving from one session to work in another just requires pressing a key.

The number of sessions that can be displayed at one time and the user's ability to control the presentation of these sessions on the screen make the 3270 Personal Computer unique among 3270 display terminals. HELPER, the online tutorial program provided with the 3270-PC, explains its capabilities and functions, and introduces the novice to the use of the screen management functions.

The 3270-PC is available in several configurations of these elements:

- 5271 System Unit, Models 2, 4, or 6, with an adjustable keyboard attached with a flexible cord
- 5151 Monochrome Display or 5272 Color Display
- 3270-PC Control Program
- 3270-PC File Transfer Program
- IBM DOS 2.1
- 5152 Graphics Printer

The color and monochrome monitors display 24 lines of 80 characters during host sessions, and 25 lines of 80 characters during an IBM Personal Computer DOS 2.1 session.

The keyboard has a typewriter character set. The 3270 host keytops are printed in black, and keytops unique to IBM Personal Computer operations are printed in blue. The system unit allows storage and retrieval of information on flexible diskettes and hard disks. Two methods of printing are available: from a host printer attached to a control unit or from an attached personal computer printer.

During customization, the 3270-PC is set in one of two host interactive modes:

Distributed function terminal (DFT) mode runs from one to four 3270 sessions emulating a model 3178, 3179, 3278 (except model 1), or 3279.

Control unit terminal (CUT) mode runs just one session emulating a 3178, 3179, 3278 Model 2, or a 3279 Model S2A.

In these modes the user can:

- Copy information between 3270 sessions (DFT only).
- Record a series of keystrokes that can be played back (autokey recording).
- Change the colors of characters and the background on the screen (on a color display).
- Change the size, shape, and placement of the windows.
- Create up to ten different screen profiles (arrangements of the windows on the screen).
- Save screen profiles, autokey recordings, and notepad information when powering off the machine, and restore them when powering on.
- Call up Help panels for guidance in working with various sessions and functions.
- Transfer files from a host computer to a personal computer session

In control unit terminal mode, the 3270 Personal Computer attaches to any model 3274 via a Type A terminal adapter. In distributed function terminal mode, it attaches to certain models of the 3274 Control Unit (see Figure 6-1). Attachment requires one physical Type A port and from one to four logical addresses. Category B terminals cannot be attached to a 3274 Control Unit that is customized to support 3270 Personal Computers operating in distributed function mode.

The 3270-PC has data stream compatibility for alphanumeric applications with all 3178 models and all 3278 models except Model 1, and the 3279. However, it does not support a multiple-partition data stream. No programming changes are needed for current alphanumeric applications if the hardware features used on the 3270 display are available on the 3270 Personal Computer. The 3270-PC supports 3270 data stream in control unit terminal mode, and extended data stream in distributed function terminal mode. The IBM Personal Computer DOS 2.1 session permits the operation of all-points-addressable (APA) graphics with the APA graphics card installed. In distributed function terminal mode, the 3270-PC supports programmed symbols with the installation of the programmed symbols (PS) adapter card.

IBM 3270 Personal Computer/G

3270 Personal Computer/G and /GX

The interactive graphics capabilities of the 3270 Personal Computer are greatly enhanced by the 3270 Personal Computer/G and /GX work stations. The 5279 and 5379 all-points-addressable (APA) displays with their associated display attachment units, system unit, and keyboard, provide comprehensive graphics facilities both for host-interactive and personal computer applications. Vector graphics are used to create and manipulate (reduce or enlarge, move, change the orientation of) complex pictures, charts, drawings, foils, and other graphics forms.

The 3270-PC Graphics Control Program offers the same screen management functions as the 3270-PC Control Program, extending these functions for the manipulation of graphics as well as alphanumeric data. One personal computer session, up to four host sessions, and up to two notepad sessions can be displayed at one time.

The work stations support 3270 alphanumeric and graphics application programs running in the host and, by emulating the Color Graphics Adapter of the IBM PC, can run programs under PC DOS 2.1 taking advantage of the screen with up to 8 colors on the 5279 display and 16 colors on the 5379.

The work stations are available in the following configurations:

- ***3270 Personal Computer/G***: 5279 Display (color) with 5278 Display Attachment Unit; 5371 System Unit Model 12, 14, or 16; standard or APL 3270-PC keyboard; Graphics Control Program; and PC DOS 2.1.

- ***3270 Personal Computer/GX***: 5379 Display Model C01 (color) with 5378 Display Attachment Unit Model C01; 5371 System Unit Model 12, 14, or 16; standard or APL 3270-PC keyboard; Graphics Control Program; and PC DOS 2.1.
- ***3270 Personal Computer/GX***: 5379 Display Model MO1 (monochrome) with 5378 Display Attachment Unit Model MO1; 5371 System Unit Model 12, 14, or 16; standard or APL 3270-PC keyboard; Graphics Control Program; and PC DOS 2.1.

A number of optional devices—graphics printers, plotters, tablets, and a mouse—can also be attached.

The choice of work station configurations depends upon the application:

- The 5279 is a medium-resolution, 14-inch color display offering 720 X 512 pels (picture elements) for general graphics work. Simple pictures, pie charts, histograms, bar charts, and other graphics forms may be created and manipulated. For alphanumeric data, the 5279 can display either 2560 characters in 80 columns by 32 rows or 3920 characters in 80 columns by 49 rows. The screen can be tilted and swiveled for operator comfort.
- The 5379 Model CO1 is a high-resolution, 19 inch color display offering 960 X 1000 pels for precision graphics work such as map drawing and electronic design, where color coding offers an advantage. Up to 4000 characters can be displayed as 80 columns by 50 rows for alphanumeric applications. The screen can be tilted and swiveled for operator comfort.
- The 5379 Model MO1 is a high-resolution, 19 inch monochrome display offering 960 X 1000 pels for precision graphics and text application work—engineering drawings and page composition. Up to 4000 characters can be displayed as 80 columns by 50 rows for alphanumeric applications. The screen can be tilted and swiveled for operator comfort.

There are two modes for attaching the 3270 Personal Computer/G and /GX work stations to the 3274 Control Unit:

- In Distributed Function Terminal (DFT) mode —required for the graphics functions of the work stations— the work stations attach to certain models of the 3274 (See Figure 6-1). Attachment requires one physical Type A port and from one to four logical addresses.
- In Control Unit Terminal (CUT) mode, the work stations attach to any model of the 3274. In this mode, only one host session can be run.

The 3270-PC/G and /GX work stations have data stream compatibility with 3270 displays for alphanumeric applications and, in DFT mode, support 3270 extended data stream and extended highlighting. No programming changes are needed for current alphanumeric applications unless the program is affected by 3274 Control Unit configuration restrictions and as long as the hardware features used on the 3270 display are available on the 3270-PC. Application programs written for the 3279 using GDDM (Graphical Data Display Manager) can migrate without change using GDDM Release 4.

IBM 3290 Information Panel

3290 Information Panel

The IBM 3290 Information Panel is a display station that features a large, flat plasma panel as its visual display medium. The smudge-resistant screen can display up to 9920 characters (62 rows by 160 columns). The panel can be tilted forward or backward, and the slope of the keyboard and optional keypad can be adjusted.

Multiple screen viewing capability means that the 3290 will operate up to four display stations (logical terminals) simultaneously at the one physical terminal. All four screens can appear together, and each can interact independently with its own host program. The operator uses the keyboard to work with each of the displayed terminals, one at a time. The viewing area can display concurrently: four 3278 Model 2 screens; or two 3278 Model 3 screens; or two 3278 Model 4 screens; or two 3278 Model 5 screens. The 3290 can also display a full page of 132-column computer printout or two pages of 80-column text.

The 3290 keyboard is available in a Typewriter or APL layout. Keyboard functions can be expanded by adding either a numeric keypad or a program function keypad.

- The operator selects the desired screen configuration for screen splits, and can set up one or more of the screens as a copy screen for the active screen. The copy screen can then be used as a reference when the operator modifies the data displayed on the active screen.

- The customer can develop up to six sets of Programmed Symbols, for a variety of shapes, fonts, and symbols.

- Using the Keyboard Definition Function, the customer can develop up to three alternative keyboard layouts for particular applications, in addition to the standard keyboard layout.

- Entry Assist: The 3290 can operate much like a power typewriter. Capabilities include: setting left and right margins, tabbing, a bell to signal the end of the line, cursor movement by word, and the wordwrap mode which automatically moves the last word on a line to the next line if it would overrun the right margin.

- The rule line, a viewing aid, moves up or down on the screen with the cursor. This horizontal line, a full screen in width, can be turned on or off.

- The image of one displayed screen, or of a partition, can be enlarged by changing the character size.

- Under program control, the screen can be divided into up to 16 partitions.

- The 3290 attaches only to certain models of a 3274 Control Unit (see Figure 6-1). At least one 3178, 3179, 3180, 3278, or 3279 must also be attached to the 3274.

The 3290 provides data stream compatibility with the 3278 and 3279 display stations. Existing alphanumeric applications run on the 3290 displayed in their current screen size. No programming changes are required for current alphanumeric applications unless the program is affected by 3274 Control Unit configuration restrictions (for example, no Category B terminals, 3279 extended color, etc.) or by required hardware functions not available with the 3290 (magnetic readers, ASCII, Encryption/Decryption, color, etc.). The 3290 interacts with structured-field data-stream functions.

The multiple screen facilities of the 3290 can be used without modifications to system software, with the exception of TSO/VTAM.

IBM 3178 Display Station

3178 Display Station (Models C1, C2, C3, and C4)

The 3178 is a compact, lightweight display station, economically sized for the office environment. It can be flexibly situated in a work station because it has three separate and movable elements: the display unit, the logic unit, and the low-profile keyboard. Optional accessory extension cables for the keyboard and display unit allow the logic unit to be mounted up to seven feet away from keyboard and display. The mounting bracket, also an accessory, can be used to install the logic unit on the side of a desk or a file cabinet, or on the wall, producing a compact desk-top arrangement for the keyboard and display. Separate elements make it easier for the operator to isolate a problem while trouble-shooting; any one element can be individually replaced.

The 3178 was designed with operator comfort in mind. The etched screen reduces light reflections and fingerprint smudges. The display terminal sits on a pedestal and can be tilted and swiveled. The keyboard can be adjusted to two different angles.

The display capacity is the same for each model; the screen displays 24 rows of 80 characters each. Each model has a different keyboard:

- Model C1 has a 75-key Data Entry keyboard.
- Model C2 has an 87-key Typewriter keyboard.

- Model C3 has an 87-key Typewriter keyboard with a numeric keypad, and is available in U.S. English only.

- Model C4 has an 87-key Typewriter keyboard with a numeric keypad in both uppercase and lowercase, and is available in U.S. English only.

The following characteristics apply to all models of the 3178:

- Audible alarm, keyboard numeric lock, and security keylock are standard functions.

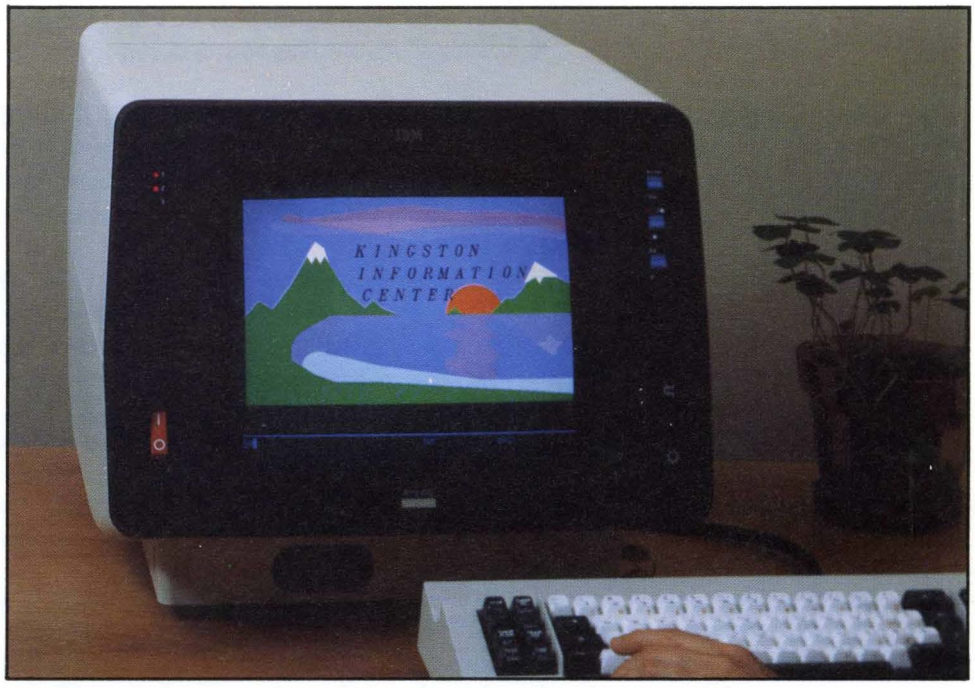
- All models attach to Type A terminal adapters on a 3274 Control Unit.

- All models attach to a 3276 Control Unit operating in SDLC protocol.

- All models attach to a 3276 Model 2, 3, or 4 operating in binary synchronous communication (BSC) protocol.

- All models, except Models C3 and C4, attach to a 4321 or 4331 Processor. (via the Display Printer Adapter)

- All models attach to existing and new IBM Switch Control Units.



IBM 3279 Color Display Station

3279 Color Display Station (Models S2A, S2B, S3G, 2C, 02X, and 03X)

The 3279 color display station can be used both in text and graphic applications. The display unit can be tilted. The following keyboard features are available: Typewriter, Data Entry, Data Entry Keypunch, APL, Text, Overlay, Operator Console, and Attribute Select.

Model S2A provides the base colors on a field basis: white, red, blue, and green. The screen displays up to 24 lines of 80 characters each.

Model S2B provides extended colors on both a character and field basis: pink, yellow, and turquoise, white, red, blue, and green. Extended highlighting (underscore, blinking, and reverse video) and APL/Text character set is standard. The screen displays up to 24 lines of 80 characters each.

The Model S3G provides programmed symbols as well as extended colors, extended highlighting, and APL/Text character set. Programmed symbols permit the user to define special characters, symbols, or shapes to suit particular applications. The Model S3G screen displays up to 32 lines of 80 characters each.

The Model 2C Color Display Console attaches to the 4300 Processors, and provides the operator with system information for normal operations and maintenance. Base color is provided on a field basis: white, red, blue, and

green. The console displays up to 24 lines of 80 characters each. An Operator Console Keyboard is required for the Model 2C.

The features available on Models 02X and 03X can be customized to meet your specifications. The models differ in the display capacity of their screens: Model 02X displays 24 lines of 80 characters each, and Model 03X displays 32 lines of 80 characters each.

The following characteristics apply to all models of the 3279:

- The base color switch on all models allows the operator to choose to display in base color or in monochrome. In the base color mode, the colors of the fields depend on their protection and intensity characteristics. In the monochrome mode, characters on the screen are green, except in intensified fields. There the characters are displayed as white. When extended color is used, the position of the base color switch does not affect the colors displayed.

- When the colored dots appear in their correct positions on the screen, the picture quality and color sharpness are good and the color is termed "converged." Certain models have automatic color convergence. With the others, there is a simple procedure the operator can carry out to set up and maintain color convergence.

- An audible alarm sounds whenever the operator enters a character in the next-to-last position on the screen. The alarm can also be activated under program control. The operator can modify the volume.

- All models, except Model 2C, attach to the 3274 via a Type A terminal adapter. For base color mode, Models S2A, S2B, and 02X attach to all models of the 3276 Control Unit Display Station, except Model 1. Models S3G and 03X attach to all models of the 3276 except Models 1 and 2, for base color mode.

The IBM 3270 Personal Computer Attachment adds IBM Personal Computer capability to all 3279 display stations.

IBM 3278 Display Station Model 4

3278 Display Station (Models 2, 2A, 3, 4, and 5)

The 3278 models vary according to the density and amount of data displayed on the screen. The Model 2 uses larger characters and more space between the lines to display 24 rows of 80 characters. Using smaller character sizes and less space between the lines, the Model 3 displays 32 rows, and the Model 4 displays 43 rows of 80 characters. The Model 5 screen displays either 24 rows of 80 characters or 27 rows of 132 characters. The Model 2A and its accompanying keyboard is used as the primary system console for 4300, 3081, 3083, and 3084 processors.

At the 3278 display station, the operator can use either a keyboard or a selector pen, or both, to display and manipulate data on the screen. The selector pen is a hand-held device used to select items from a list of data. The following keyboard features are available: Typewriter, Data Entry, Data Entry Keypunch, APL, Text, Overlay, and Attribute Select.

- A monocase switch makes it possible to change back and forth from dual case display (mixed uppercase and lowercase) to monocase display (uppercase only).

- An application program can define fields of data on the screen as protected/unprotected, alphanumeric, normal/intensified, and displayed/nondisplayed.

- The Print key can be used to send a copy of what is currently displayed on the screen directly to an authorized printer.

- Audible alarm, keyboard numeric lock, and security keylock are standard.

- There are several features that significantly enhance the capabilities of a 3278:

  The Programmed Symbols feature allows the customer to define up to six 190-symbol sets for a variety of shapes, fonts, and symbols.

  Extended highlighting for particular characters or a field: blinking, reverse video, or underscore.

  The Overlay and Attribute Select keyboards are equipped with keys that provide immediate access to the programmed symbol sets and desired highlights.

- The IBM 3270 Personal Computer Attachment adds IBM Personal Computer capability to the 3278 display stations.

- The 3278 Models 2, 3, and 4 can attach to Type A terminal adapters on a 3274. The Model 5 can attach to the Type A terminal adapters on every 3274 model except Model 21B.

- Models 2, 3, and 4 can attach to a 3276 Control Unit Display Station, using SDLC protocol.

- Models 2, 3, and 4 can attach to a 3276, using BSC protocol. The Model 2 can only attach to a 3276 Model 2, 3, or 4. The Model 3 can attach only to a 3276 Model 3 or 4. The Model 4 can attach only to a 3276 Model 4.

3277 Display Station (Model 2)

The 3277 station displays up to 24 rows of 80 characters on its screen. The following keyboards are available: Typewriter, Data Entry, Data Entry Keypunch, Operator Console, APL, and Text.

- A special-order graphics attachment (RPQ) for the 3277 allows you to attach a non-IBM graphic storage display monitor, a non-IBM digitizing tablet and digital plotter, or an IBM 7406 device coupler. This can be used to create a work station with dual screen interactive graphics for applications such as mapping, technical data analysis, presentation business graphics, drafting, document preparation, and conversational programming.

- An application program can define fields of data on the screen as protected/unprotected, alphanumeric, normal/intensified, and displayed/nondisplayed.

- The Print key can be used to send a copy of what is currently displayed on the screen directly to an authorized printer.

- The 3277 Model 2 attaches to the Type B terminal adapter on certain models of the 3274 Control Unit.

- It attaches to a 4300 Processor, or to an 8100 Information System.

Chapter 4. Keyboards

The keyboard is your tool for controlling the display station, signalling the application program, and entering information. A display keyboard looks similar to a typewriter keyboard, but the characters you type are printed on the screen instead of on paper. Using the keyboard, you can bring to the screen data that was previously entered at the keyboard and filed away.

For each 3270 Display Station there are several IBM keyboards, each with a key layout designed to suit a particular job —such as word processing, data entry, or programming. A modifiable keyboard is also available for some display models so that you can define your own keyboard layouts. All of the keyboards have alphabetic keys, numeric keys, special symbol keys, and control keys for entering information. Whatever your choice of keyboards, you will find that they are designed to be comfortable, easy to use, and versatile.

All alphanumeric, special symbol, and cursor-positioning keys are typematic. When the key is held down, the character will be typed repetitively until the key is released.

The number of keys can range from 66 keys for the IBM 3277 Display Station up to 122 keys on a 3270 Personal Computer keyboard.

Keyboards are available in a number of national languages. Displays with typewriter, data entry, or data entry keypunch keyboards may be mixed when attached to a 3274 Control Unit or the 3276 Control Unit Display Station, but the keyboard languages must be the same. EBCDIC, APL/Text, and ASCII character sets are available. Consult your IBM marketing representative for more information about national language keyboard versions and character sets.

Figure 4-1. IBM 3270 Personal Computer Keyboard

Touch Typing Controls

These controls are located in the touch typing area of the keyboard, where the alphanumeric and graphic characters are found.

- **Uppercase Shift**
- **Uppercase Shift Lock**
- **Alpha Shift** (Data Entry Keyboards only): overrides the numeric input field definition and the Keyboard Numeric Lock condition to allow input of alphanumeric data in a numeric field.
- **Numeric Shift** (Data Entry Keyboards only): overrides the numeric field definition and Numeric Lock condition to allow entry of upshift characters.
- **Tabbing Keys**
- **Backspace Keys**
- **New Line Key:** moves the cursor to the beginning of a new line.
- **Reset Key:** used to recover from Do Not Enter conditions. The Reset key can also be used to cancel certain operations. It causes user input such as a print request to be ignored and reverts to the program state prior to the input.
- **Device Cancel Key** (3179, 3180, 3278, 3279, 3290): cancels a pending print request to the printer.
- **Quit Key** (3270-PC): cancels the current action performed.
- **Enter Key:** tells the program that you have completed your message and are waiting for the information on your screen to be entered into the host system.

General Controls

Located on the left side of the keyboard, most of these controls can be used in many applications. Some of them are used only to place the keyboard in a different mode.

- **Attention Key:** provides a means of getting the program's attention. The program that is operating in the host system determines how the Attention key is used.
- **System Request Key:** can perform two different functions. The System Request key can be used to send a signal to the host system to tell the program that you have a test request message. Or it can be used to clear your display screen and switch the display station between the application and control programs.
- **Cursor Select Key:** duplicates the operation of the selector pen and is typically used to select items from a list, menu or table.

- **Erasing Controls** —the Clear, Erase Input, and Erase to End of Field keys. The operator uses the Clear key to erase the entire display screen and the display format. The Erase to End of Field key is used when the operator has entered some data into part of a field and wants the rest of the field erased. The Erase Input key is used to erase all data input fields on the display screen.

- **Print Key:** Requests a printed (hard) copy of the information on the screen from the printer assigned to that display station.

- **Copy Key:** Copies data from one session to a copy area on the screen (3290) or to another session on the screen (3270-PC).

- **Record and Play Keys** (3180, 3270-PC): the Record key records sequences of keystrokes for automatic playback using the Play key.

- **Rule Key** (3290): places a horizontal line under the row containing the cursor on the screen.

- **Setup Mode** (3180, 3290, 3270-PC): allows you to change the layout of the screen and select other default options.

- **Extended Select Shift** (3178, 3179, 3180, 3278, 3279, 3290, 3270-PC): for the 3290, this changes the function of certain program function keys. For the 3178, 3179, 3180, 3278, 3279, and 3270-PC this extends the keyboard for such functions as remote communication and response time monitoring.

- **Workstation Control Mode** (3270-PC): enables you to perform screen management functions.

- **Doc On Off**: puts the display in document mode, enabling the entry assist functions.

- **Enlarge** (3270-PC): changes the size of a window to fill the entire screen, without changing the character size.

- **Zoom** (3290): causes the active screen to be displayed with the largest allowable character size, filling the entire screen.

Screen Management, Program Access, and Editing Controls

The cursor is a movable marker that looks like a short underscore line; it indicates where the next character you type will be displayed. A visual aid, the cursor helps you focus on the active area of the screen. It moves automatically across the screen as you type. You can also control the cursor, moving it to any position on the screen to indicate where to enter, replace, or delete characters.

To the right of the touch-typing area are the frequently used keys for screen management, cursor positioning, editing, and program access.

- **Up and Down Cursor Keys**
- **Left and Right Cursor Keys**
- **Double-Speed Cursor, Left and Right Keys**
- **Backtab Key**
- **Cursor Home Key**: moves the cursor to the first nonprotected character position on the screen.
- **Change Screen Key** (3290, 3270-PC): displays the next screen or set of sessions after the one currently displayed.
- **Jump Screen** (3290, 3270-PC): moves the cursor to the next viewport (called "window" on the 3270-PC) on the screen.
- **Jump Partition** (3290): moves the cursor to the next partition on the screen.
- **Duplicate Key:** used during data entry to indicate that the field data from the previous record should be duplicated.
- **Field Mark Key:** used when operating with an unformatted display to indicate the end of a field to the program.
- **Insert and Delete Keys:** allow you to either add or delete characters easily. In the document mode, a typematic delete and a word delete are both available.
- **Program Access Keys** (PA1, PA2, PA3): send a signal to a program that performs display operations; no input data from the screen is transmitted to the program.

Program Function and Attribute Selection Controls

- **Program Function Keys**, PF1 through PF24: pass input data from the screen and send a signal to a program to call for a particular display operation, such as splitting a line of text or moving from the middle of a file to its starting lines on the viewing screen. Application programs can define the action that occurs when any one of the program function (PF) keys is pressed. The group of PF keys and their functions can also be programmed as an operator desires, with each key set to perform a particular function.
- **Attribute Select Keys** (3179, 3180, 3278, 3279, 3290): when supported under program control, these keys select the extended highlighting, extended color, and programmed symbol attributes of the character that is being entered.
- **Cursor Appearance Keys,** Alternate Cursor and Cursor Blink: determine how the cursor looks on the screen. The standard cursor is a nonblinking marker that looks like an underscore. The other options are a reverse image cursor (a small rectangle which, when positioned on a character, changes the color of the character to the color of the screen), a blinking reverse image cursor, or a blinking cursor. The blinking cursor is useful for teaching new users, or for screens filled with data, because it makes the cursor immediately obvious.

Keypad

A separately housed keypad (3179, 3180, 3290), an optional feature, is available for numeric data entry or program function applications. It can be located on either side of the keyboard to allow for left- or right-handed use.

Keyboard Definition Utility

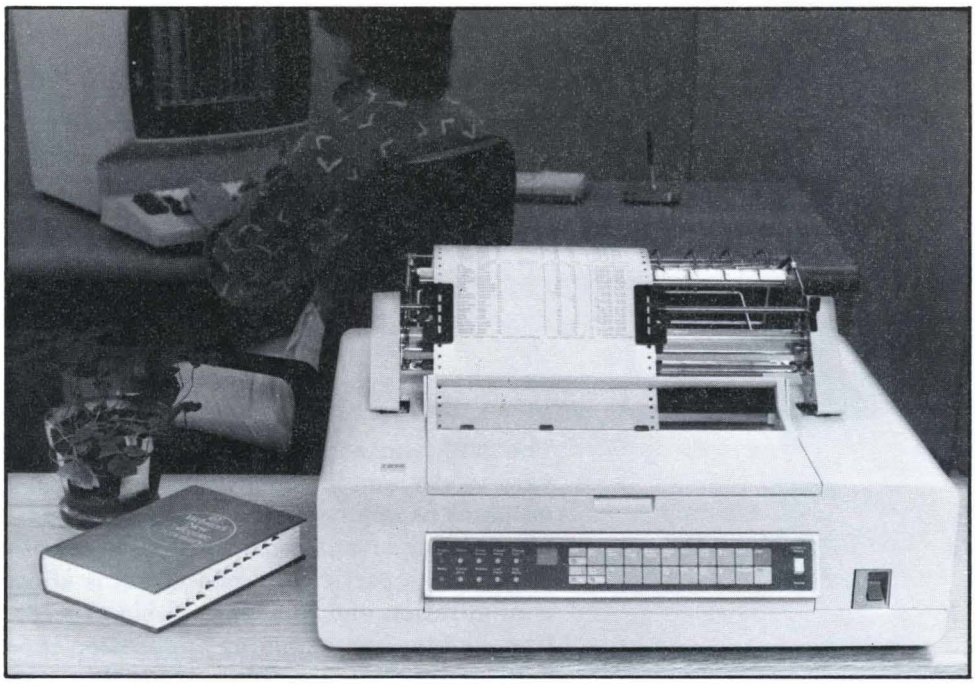
This pre-customizing procedure (3179, 3180) for the modifiable keyboard allows you to create your own uniquely defined keyboard layouts by modifying the keyboard tables in the 3274 Control Unit. Certain keycaps are removable and may be interchanged with other keycaps on the keyboard. Square shaped keycaps, like the alphanumeric and program function keycaps, are removable and interchangeable, while the larger shaped keycaps—Shift, Tab, Reset, Shift Lock, Carriage Return, Space Bar—and Alt keycaps are not.

By modifying the keyboard tables, and then moving keycaps about on the keyboard, the user can define keyboard layouts to meet specific application requirements.

Up to four keyboard layouts and their associated keyboard tables may be defined for each 3274 Control Unit. Each layout, either standard (unmodified) or modified, is assigned a keyboard ID.

Chapter 5. Printers

The 3270 family includes both dot-matrix and line printers. The models vary in size and in the print rate, vertical spacing, character pitch, and graphics capability that they offer. Please note that while print rate is often an important consideration in selecting a printer, the actual rate of output for a particular installation is affected by the control unit configuration and line transmission speed, output format, colors printed per line, and the programming application processing. When output is printed in several colors, the print rate will be reduced in proportion to the number of color changes on a page. Using the Programmed Symbols feature for dense printing or for printing nonstandard character format also reduces the rate of printer output.



IBM 5210 Printer

5210 Printer: Models G01 and G02

The 5210 is a desk-top impact printer that uses a bidirectional printwheel to produce letter quality output. The printer can be fed cut-sheet paper, manually or automatically, or can be fed continuous forms. The 5210 employs a cartridge ribbon, and the Ribbon Saver allows two modes of ribbon feed for two different qualities of print.

- Model G01, maximum print rate: 40 characters per second (96 characters, 10 pitch).
- Model G02, maximum print rate: 60 characters per second (96 characters, 10 pitch).
- Print positions: 132 for 10 pitch, 158 for 12 pitch, and 198 for 15 pitch.
- Vertical spacing: 3, 4, 5.3, 6, 8, 9.6, 12, 24, and 48 lines per inch.
- Character pitch: 10, 12, and 15 characters per inch.
- Both models can attach to a Type A terminal adapter on a 3274 Control Unit or to a 3276.

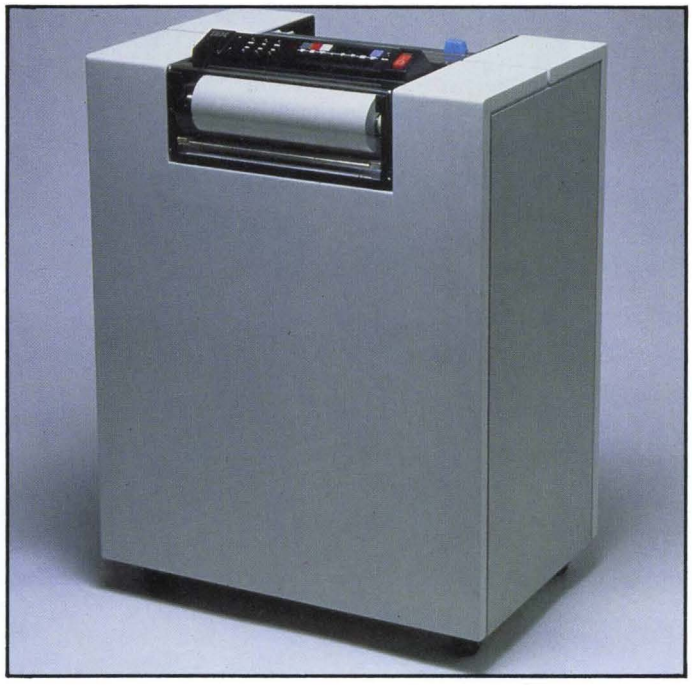
IBM 4214 Printer Model 1

4214 Printer Model 1

The 4214 Model 1 is a bidirectional, dot-matrix, desk-top printer for office or remote use. The printer can be loaded by tractor feed, document demand, or continuous forms, and produces near letter quality output. Using the operator panel, you can alter character and line spacing, margins, quality of print, and physical movement of forms. The ribbon cartridge uses a continuous loop to increase ribbon life.

- Maximum print rate: 200 characters per second (82 lines per minute).

- Attaches to the 3274 Control Unit or 3276 Display Station.



IBM 4250 Printer

4250 Printer

The 4250 is a printer used for publishing applications. A standing unit, this high resolution printer produces camera-ready print masters with text and line-art graphics intermixed. The 4250 uses a roll of aluminum coated, electro-sensitive paper.

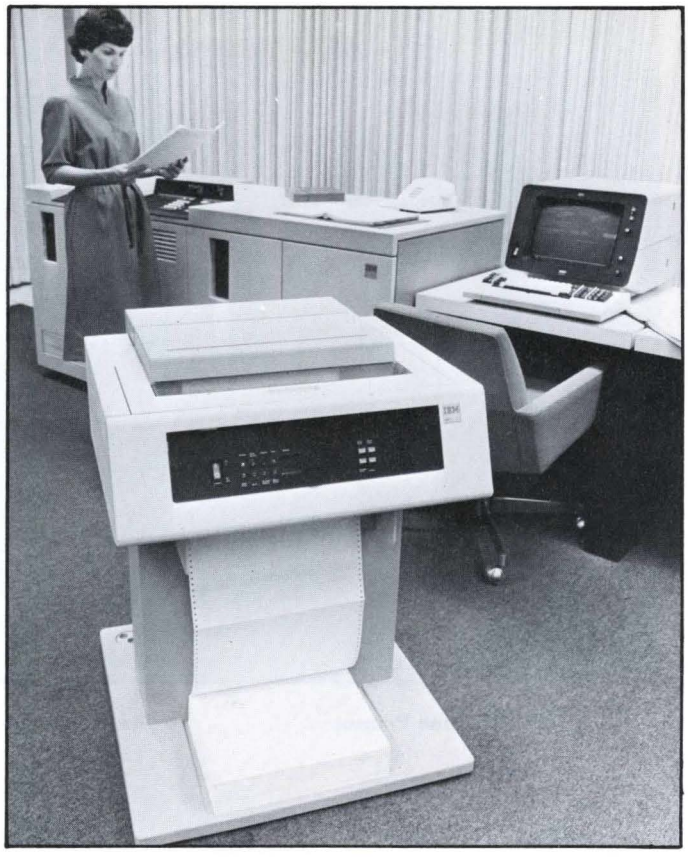
- The print head speed is 40 inches per second (1 meter per second). All points on the printable area of the page are addressable.
- The printer attaches to the Type A terminal adapter of the 3274 Models 31A, 31D, 41A, and 41D.

IBM 3262 Line Printer

3262 Line Printer: Models 3 and 13

The 3262 is a high speed line printer that produces character-engraved print on continuous forms. This floor-standing unit has an integral forms stand/stacker.

- Model 3, maximum print rate: 650 lines per minute.
- Model 13, maximum print rate: 325 lines per minute.
- Print positions: 132.
- Vertical spacing: program controlled.
- Character pitch: 10 characters per inch.
- Duplicate forms: up to 4 parts.
- Model 3 attaches to a Type A terminal adapter on a 3274 Control Unit.
- Model 13 attaches to the Type A terminal adapter of the 3274 or to a 3276 Control Unit.



IBM 3268 Printer

3268 Printer Model 2

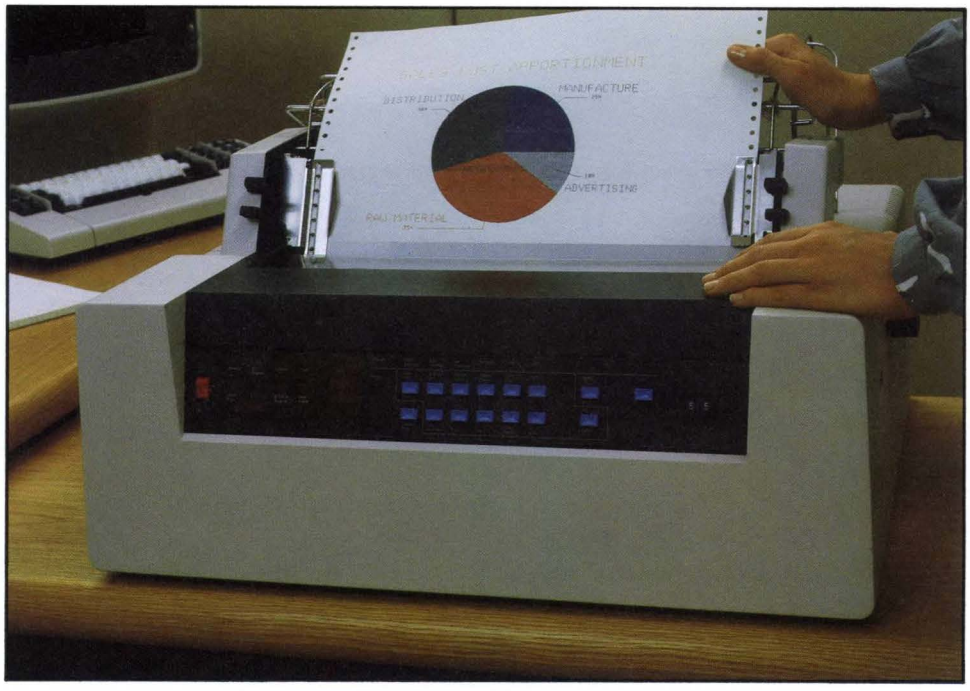
The 3268 is a high-speed dot-matrix printer with bidirectional printing capability. It uses continuous forms. The printer is a floor-standing unit with a pedestal base.

- Maximum print rate: 340 characters per second.
- Print positions: 132.
- Vertical spacing: 3, 4, 6, and 8 lines per inch.
- Character pitch: 10 and 16.7 characters per inch.
- Duplicate forms: up to 6 parts; 5- and 6-part forms should be tested individually.
- Attaches to the Type A terminal adapter of the 3274 Control Unit or to the 3276.

3268 Printer Model 2C

This 3268 printer can produce output in four colors: red, green, blue, and black. This dot-matrix printer has bidirectional printing capability, using continuous forms. The printer is a floor- standing unit, with a pedestal base.

- Programmed symbols capability makes up to six symbol sets available. Two types of symbol sets are available: those that print a single color within a character cell (all or a portion of an entire symbol), and those that print multiple colors within a character cell.
- Maximum print rate: 340 characters per second when printing alphanumeric characters; 147 characters per second when printing in all points addressable (APA) mode.
- Print positions: 132 at 10 characters per inch; 220 at 16.7 characters per inch (condensed).
- Vertical spacing: 3, 4, 6, and 8 lines per inch.
- Character pitch: 10 and 16.7 characters per inch.
- Duplicate forms: up to 6 parts; 5- and 6-part forms should be tested individually.
- Attaches to the Type A terminal adapter of the 3274 Control Unit or to the 3276. Only base color on a field basis can be printed if the printer is attached to a 3276.



IBM 3287 Printer Model 2C

3287 Printer: Models 1 and 2

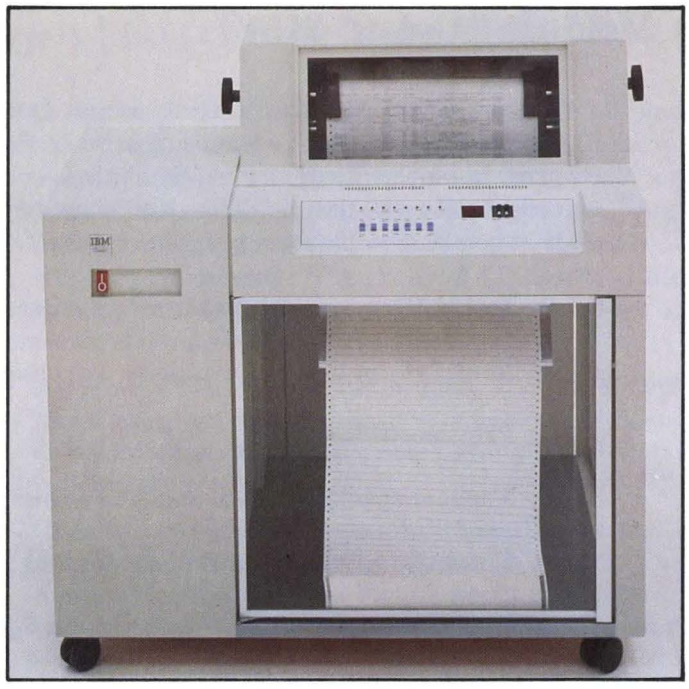
A table-top printer, this unit produces dot-matrix printout and has bidirectional printing capability. Programmed Symbols, a special feature the customer can order, allow the user to define and print symbols, characters, and shapes that combine to create a graphic representation.

- Model 1, maximum print rate: 80 characters per second.
- Model 2, maximum print rate: 120 characters per second.
- Print positions: 132.
- Vertical spacing: 3, 4, 6, and 8 lines per inch.
- Character pitch: 10 characters per inch.
- Duplicate forms: up to 6 parts; 5- and 6-part forms should be tested individually.
- Both models attach to either the Type A or Type B terminal adapter of the 3274, depending on the selected attachment feature, or to the 3276 Control Unit Display Station.

3287 Printer: Models 1C and 2C

These 3287 printers can produce output in four colors: red, green, blue, and black. (Print positions 1-120 can print in four colors; print positions 121-132 print in black.) Programmed Symbols, a special feature the customer can order, allow the user to define and print symbols, characters, and shapes that combine to create a graphic representation.

- Model 1C, maximum print rate: 80 characters per second in one color.
- Model 2C, maximum print rate: 120 characters per second in one color.
- Print positions: 132.
- Vertical spacing: 3, 4, 6, and 8 lines per inch.
- Character pitch: 10 characters per inch.
- Duplicate forms: up to 6 parts; 5- and 6-part forms should be tested individually.
- Both models attach to the Type A terminal adapter of the 3274 and to the 3276. Only base color on a field basis can be printed when the printer is attached to a 3276.



IBM 3289 Line Printer

3289 Line Printer: Models 1 and 2

The 3289 is a medium speed line printer that produces character-engraved quality print on continuous forms. This floor-standing unit has an integral forms stand/stacker.

- Model 1, maximum print rate: 155 lines per minute.
- Model 2, maximum print rate: 400 lines per minute.
- Print positions: 132.
- Vertical spacing: 6 and 8 lines per inch.
- Character pitch: 10 characters per inch.
- Duplicate forms: up to 6 parts.
- Both models attach to the Type A terminal adapter of a 3274 or to a 3276.

Chapter 6. Control Units

The control unit is the vital link in the 3270 Information Display System, connecting the display stations and printers to the host data processing system. Display stations and printers attached to control units can be installed in many different configurations, depending on the demands of your business.

To select a control unit model that is suitable for your particular configuration, you need to know the method by which the control unit will be attached to the host computer (whether local, remote, or on a loop), the number and type of display stations and printers to be attached to the control unit, and their base function and features.

The 3270 Control Units can attach to a host data processing system in several ways:

- Local attachment directly to a host system channel.
- Remote attachment via binary synchronous communications (BSC) protocol or Synchronous Data Link Control (SDLC) protocol, either through communication facilities or through direct connection via an Electronic Industries Association (EIA) or International Telegraph and Telephone Consultative Committee (CCITT) interface. Remote models of the 3274 are capable of operating over X.21 and X.25 facilities.
- Direct-connection to the IBM 8100 Information System, or to the IBM 3704, 3705, and 3725 Communication Controllers.
- Loop attachment either to a data-link-attached or to a directly-attached loop of the IBM 8100 Information System and the IBM 4300 Processor Complex.

  The System/370 and 4300 System can operate as a host computer to any 3270 display systems that are remotely attached and using BSC protocol. The System/370, 4300 System, 8100 Information System, 303X Processor, and 3081 Processor can operate as a host computer to any 3270 display system that is remotely attached and using SDLC protocol.

IBM 3274 Control Unit Model 41D

Attaching Terminals

When attached to a control unit, display stations and printers are referred to as "terminals." Those displays and printers developed specifically to attach to the 3274 Control Unit are called Category A terminals. Category B terminals are designed to attach to earlier control unit models, the 3271 and 3272. (Any models that control large clusters of up to 32 terminals, including Category B terminals, can only attach a maximum of 16 Category B terminals.) On a control unit, Type A adapters attach Category A terminals, and Type B adapters attach Category B terminals. A third adapter, the 3299 Terminal Multiplexer, attaches only Category A terminals to all models of the 3274 except Model 51C. Using the 3299 Terminal Multiplexer requires less cable.

The 3274 Control Units can be grouped conveniently according to their type of attachment and the size of the cluster of display stations and printers they can control.

- Locally attached Models 21A, 21B, 21D, 41A, 41D, 31A, and 31D can control a large cluster of up to 32 display stations and printers.

- Remotely attached Models 21C, 41C, and 31C can control a large cluster (up to 32 terminals).

- Remotely attached Models 51C and 61C control midsized clusters. The Model 51C controls up to 12 display stations and printers, and the Model 61C controls as many as 16.

Storage

Displays and printers have a diversity of features. The models of the 3274 Control Unit differ on the basis of the the displays and printers that they support (see Figure 6-1). The greater the amount of storage a particular control unit model offers, the more functions and features it can support.

- Models 21A, 21B, 21C, and 21D have 64K bytes of storage. They deliver basic functions at an economical price.

- Model 51C also is designed to support basic functions at an economical price. Its 64K bytes of storage can be upgraded to 128K or 192K bytes to support added features, as your system is expanded.

- Models 41A, 41C, 41D, and 61C have 192K bytes of storage, and this can be upgraded to 320 bytes. The simplicity of their design makes them easy to use. They support multiple features, possess functions and features compatible with earlier models of the 3274, and are easily configured.

- Models 31A, 31C, and 31D have 128K bytes of storage, and this can be upgraded to 192K bytes. Models 31A, 31C, and 31D are recommended only for those installations where Category B terminal support is still required. Otherwise, Models 41A, 41C, or 41D should be considered.

Customization

As part of the installation procedure for all 3274 models, from two to seven diskettes are used to generate a customized initial-microcode-load (IML) diskette that supports the configuration of display stations and printers that your business requires. The IML diskette gives the 3274 all the information about the system required for startup at power-on time.

To customize a diskette, the operator follows a procedure for typing in the system configuration features at the keyboard of a display station attached to the 3274. A user-customized diskette can be recustomized as you add or remove features to meet your changing needs. Backup IML diskettes may be generated by following a similar procedure.

Terminals	Channel Attached SNA 21A	31A	41A	Channel Attached Non-SNA 21B	21D	31D	41D	Remotely Attached 21C	31C	41C	51C	61C
Category A Displays												
3178 Model C1	X	X	X	X	X	X	X	X	X	X	X	X
Model C2	X	X	X	X	X	X	X	X	X	X	X	X
Model C3	X	X	X	X	X	X	X	X	X	X	X	X
Model C4	X	X	X	X	X	X	X	X	X	X	X	X
3179 Color Display Station	4	X	X	4	4	X	X	4	X	X	X	X
3180 Model 1	X	X	X	X	X	X	X	X	X	X	X	X
3270-PC	5	X	X	5	5	X	X	5	X	X	X	X
3270-PC/G and /GX	5	X	X	5	5	X	X	5	X	X	X	X
3278 Model C2	X	X	X	X	X	X	X	X	X	X	X	X
Model C3	X	X	X	X	X	X	X	X	X	X	X	X
Model C4	X	X	X	X	X	X	X	X	X	X	X	X
Model C5		X	X			X	X		X	X	2	X
3279 Model S2A	X	X	X	X	X	X	X	X	X	X	X	X
Model S2B	4	X	X	4	4	X	X	4	X	X	X	X
Model S3G	4	X	X	4	4	X	X	4	X	X	X	X
Model 2X	4	X	X	4	X	X	X	4	X	X	X	X
Model 3X	4	X	X	4	X	X	X	4	X	X	X	X
3290		X	X			X	X		X	X	X	X
Category A Printers												
3262 Model 3	X	X	X	X	X	X	X	X	X	X	X	X
Model 13	X	X	X	X	X	X	X	X	X	X	X	X
3268 Model 2	X	X	X	X	X	X	X	X	X	X	X	X
3268 Model 2C	4	X	X	4	X	X	X	4	X	X	X	X
3287 Model 1	X	X	X	X	X	X	X	X	X	X	X	X
Model 1C	4	X	X	4	X	X	X	4	X	X	X	X
Model 2	X	X	X	X	X	X	X	X	X	X	X	X
Model 2C	4	X	X	4	X	X	X	4	X	X	X	X
3289 Model 1	X	X	X	X	X	X	X	X	X	X	X	X
Model 2	X	X	X	X	X	X	X	X	X	X	X	X
4214												
4250		X	X			X	X					
5210 Model G01	X	X	X	X	X	X	X	X	X	X	X	X
Model G02	X	X	X	X	X	X	X	X	X	X	X	X

Figure 6-1 (Part 1 of 2). 3274 Control Units and the Terminals They Support (see Legend)

Terminals	Channel Attached SNA 21A 31A 41A	Channel Attached Non-SNA 21B 21D 31D 41D	Remotely Attached 21C 31C 41C 51C 61C
Category B Displays			
3277 Model 2	X	X X X	1 X 3
Category B Printers			
3278 Model 1	X	X X X	1 X 3
Model 2	X	X X X	1 X 3

Legend:

X Indicates that attachment is possible.

1 Binary synchronous communication operation only.

2 Requires additional storage.

3 SNA/Synchronous Data Link Control operation, requiring additional storage.

4 Base color operation only.

5 Control unit terminal mode only.

Figure 6-1 (Part 2 of 2). 3274 Control Units and the Terminals They Support (see Legend)

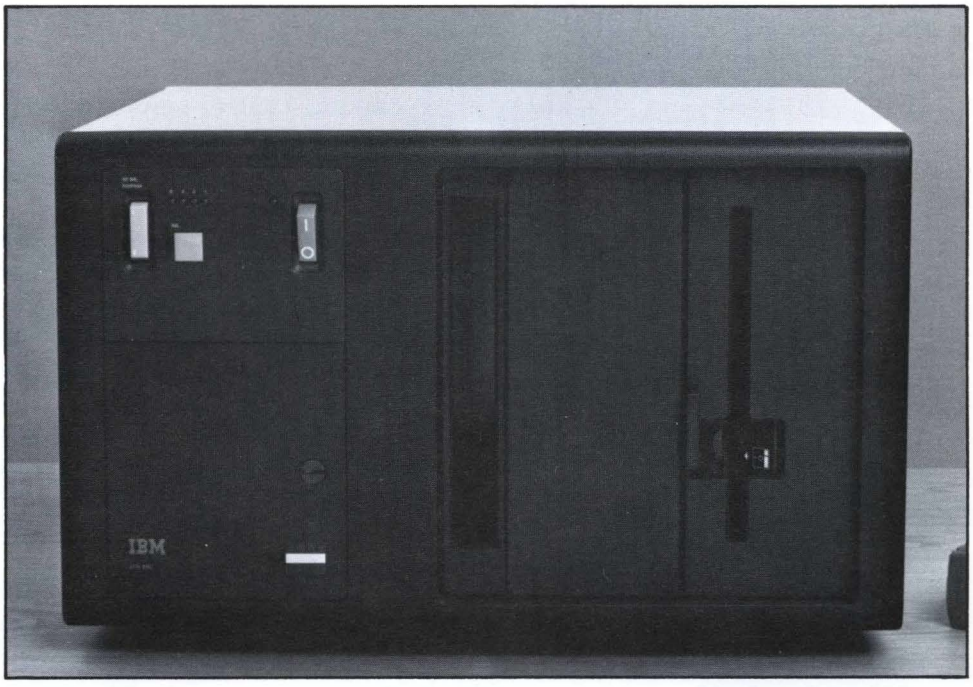
3274 Models 41A, 41C, 41D, and 61C

Models 41A, 41C, 41D, and 61C have the same functions and features as the Models 31A, 31C, 31D, and 51C, respectively, but they do not support any Category B terminals. These newer models all have 192K bytes of storage and a double-sided diskette drive. Additionally, 128K of storage may be added (for a total of 320K) to support additional functions such as X.25 communications. A number of standard provisions make these models easy to install and configure:

- Models 41A, 41C, and 41D have 32 Category A terminal ports. Suited for a smaller system, the Model 61C has 16 such ports.
- Support for the 3290 Information Panel.
- Standard voltage options and communications cable.
- Category A adapters to support Category A terminals or the 3299 Terminal Multiplexer.

The models differ in their method of attachment to a host processing system:

- Model 41A: Local attachment (SNA). See the description of Model 31A for details.
- Model 41D: Local attachment (non-SNA). See the description of Model 31D for details.
- Models 41C and 61C: Communicate remotely using SDLC or BSC protocol. For details, see the descriptions of Model 31C and 51C, respectively.



IBM 3274 Control Unit Model 51C

3274 Model 51C

A table-top model, the Model 51C can control up to 12 display stations and printers for remote communication with the host system. The base Model 51C permits attachment of eight Category A terminals. Its base 64K bytes of storage can be increased to 128K, 192K, or 256K as the system is enhanced. The 51C communicates remotely in the same manner as Models 21C and 31C. With the appropriate configuration support, it provides all the functions supported by those models, but it does not support the 3299 Terminal Multiplexer. Additionally, Model 51C can:

- Communicate with a 4331 Processor or the 8100 Information System via a directly-attached loop using SDLC and operate in half-duplex mode at 9,600 or 38,400 bps over the loop.
- Communicate with a 4331 Processor or the 8100 Information System via a data-link-attached loop using SDLC and operate in half-duplex mode at 1,200 or 2,400 bps over the loop.
- Operate in half-duplex point-to-point mode using SDLC at transmission speeds of 1,200, 2,400, 4,800, and 9,600 bps on switched facilities.
- Communicate with the 8100 Information System via direct connection (without modems or communication facilities) at speeds up to 56,000 bps using SDLC protocol.

The Model 51C supports the same functions on the same terminals that the 3276 Control Unit Display Station supports, except for the 3276 printer default matrix. Additionally, it can control more terminals.

3274 Models 21A, 21B, 21D, 31A, and 31D

These floor-standing control units can control up to 32 display stations and printers for local attachment to a host system. Models 21A, 21B, and 21D have 64K bytes of storage; Models 31A and 31D have 128K bytes of storage.

- Models 21A and 31A: Local attachment (SNA version) to a System/370 processor is via a byte multiplexer, selector, or block multiplexer channel,[1] or to a 303X or 3081 via a byte multiplexer or block multiplexer channel. Attachment to a 4300 processor is via byte multiplexer or block multiplexer channels.

- Models 21B, 21D, and 31D: Local attachment (non-SNA) to a System/370 processor is via a byte multiplexer, selector, or block multiplexer channel,[1] or to any 303X, 3081, or 4300 processor via a byte multiplexer or block multiplexer channel.

- If there is a need to add functions to your system, these models can be enhanced. The Models 21A and 21D can be upgraded to Models 31A, and 31D, and the storage on a Model 31A or 31D can be increased to 256K bytes.

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1 Because of performance considerations, which may yield less than maximum output, attachment to a non-DCC subchannel of a block multiplexer channel or to a selector channel is not recommended.

3274 Models 21C and 31C

These floor-standing control units can control up to 32 display stations and printers for remote attachment to a host system. Model 21C has 64K bytes of storage; Model 31C has 128K bytes and can be expanded to 192K or 256K for enhanced functions. Functionally compatible, both the Models 21C and 31C:

- Communicate with a System/370 or 4300 processor using SDLC protocol via a 3704, 3705, or 3725 Communication Controller or via the Communications Adapter feature of the 4331 Processor.
- Communicate with a System/370 or 4300 processor using BSC protocol.
- Communicate with System/370 Models 115, 125, 135, and 138, using BSC, via an Integrated Communications Adapter.
- Operate in half-duplex point-to-point or multipoint mode on half-duplex or duplex facilities, using SDLC or BSC, at transmission speeds of 2,000, 2,400, 4,800, 7,200, and 9,600 bps on nonswitched facilities. Point-to-point communication at speeds up to 56,000 bps are also possible where facilities are available. (All communications at speeds greater than 9,600 bps must use SDLC protocol.) In addition, communication via a 3705 or 3725 Communication Controller, or the Communications Adapter feature of the 4331 processor, can be by means of direct connection (that is, without modems or communication facilities) at speeds up to 57,600 bps.

IBM 3276 Control Unit Display Station with 3287 Printer

3276 Control Unit Display Station

The 3276 is a table-top control unit integrated into a display station module. It can control a cluster of up to eight display stations and printers, including its own display, and is designed for remote attachment to a host system. There are eight models of the 3276. Models 1, 2, 3, and 4 are used with BSC transmission control and Models 11, 12, 13, and 14 are used with SNA/SDLC. Models 1, 2, 3, and 4 each have a different display screen size. Models 11, 12, 13, and 14 have the same display screen sizes as Models 1, 2, 3, and 4 respectively.

All models can operate in half-duplex mode on duplex or half-duplex communication facilities. They can communicate with a 3704, 3705, or 3725 Communication Controller or the Communications Adapter feature of the 4331 Processor at 1,200 bps (SDLC or BSC) directly, without need for communication facilities or a modem.

- Models 1, 2, 3, and 4 communicate with a System 360/370, or any 4300 processor using BSC protocol over communication facilities via (where applicable) a 2701 Data Adapter Unit, a 2703 Transmission Control, a 3704, 3705, or 3725 Communication Controller, an Integrated Communications Adapter, or the Communications Adapter feature of the 4331.

  Models 1, 2, 3, and 4 operate using BSC protocol at 1,200, 2,000, 2,400, 4,800, and 7,200 bps. When the models are directly connected to a 3704,

3705, or 3725 Communication Controller, communication speed is limited to 1,200 bps.

- Models 1, 2, 3, and 4 communicate, when the SDLC/BSC switch is set to SDLC, with the 8100 system via a modem or direct connection on an SDLC data link.

- Models 11, 12, 13, and 14 communicate with the 8100 Information System via a modem or direct connection on an SDLC data link, a directly attached loop, or a data-link-attached loop.

- All models with the SDLC/BSC Switch feature communicate with a System/370 or any 4300 processor, using SDLC protocol over communication facilities, via a 3704, 3705, or 3725 Communication Controller, or via the Communications Adapter feature of the 4331 processor.

- Models 11, 12, 13, and 14 operate using SNA/SDLC protocol at 1,200, 2,400, 4,800, 7,200, and 9,600 bps. When the models are directly connected to the 3704, 3705 or 3725 Communication Controller, communication speed is limited to 1,200 bps.

  Models 1, 2, 3, and 4 with the optional SDLC/BSC Switch feature installed can operate via SDLC protocol at the same communication line speeds as Models 11, 12, 13, and 14. But if the Switch is installed, a 3279 Color Display Station cannot be attached to the 3276.

- All models can communicate with a 3704 or 3705 Communications Controller or the Communications Adapter feature of the 4331 Processor at 1,200 bps (SDLC or BSC) without need for communication facilities or a modem (direct connection).

At a 3276 display station, the operator can use either the keyboard or the selector pen (optional) to enter information. The keyboard provides all the standard editing functions. The models have varying screen capacities:

- Models 1 and 11 display up to 12 lines of 80 characters each. When operating in 3277-compatible format, the Model 1 will display 40 characters per line.

- Models 2 and 12 display up to 24 lines of 80 characters each.

- Models 3 and 13 display up to 32 lines of 80 characters each.

- Models 4 and 14 display up to 43 lines of 80 characters each.

A special nondisplayed input mode allows fields of data to be program-defined so that they will accept information entered at the keyboard without displaying it on the screen. The Security Keylock and the Audible Alarm are standard.

Figure 6-2 shows the Category A terminals supported by the various models of the 3276 Control Unit Display Station.

Terminals	1	11	2	12	3	13	4	14
Category A Displays								
3178 Model C1		X	X	X	X	X	X	X
Model C2		X	X	X	X	X	X	X
Model C3		X	X	X	X	X	X	X
Model C4		X	X	X	X	X	X	X
3179 Color Display Station		1	1	1	1	1	1	1
3180 Model 1		X	X	X	X	X	X	X
3270-PC/G and /GX		2	2	2	2	2	2	2
3278 Model 2		X	X	X	X	X	X	X
Model 3		X	X	X	X	X	X	X
Model 4		X		X	X	X		
3279 Model S2A		X	X	X	X	X	X	X
Model S2B		1	1	1	1	1	1	1
Model S3G		1		1	1	1	1	1
Model 2X		1	1	1	1	1	1	1
Model 3X		1		1	1	1	1	1
3290								
Category A Printers								
3262 Model 3								
Model 13	X	X	X	X	X	X	X	X
3268 Model 2	X	X	X	X	X	X	X	X
Model 2C	1	1	1	1	1	1	1	1
3287 Model 1	X	X	X	X	X	X	X	X
Model 1C	1	1	1	1	1	1	1	1
Model 2	X	X	X	X	X	X	X	X
Model 2C	1	1	1	1	1	1	1	1
3289 Model 1	X	X	X	X	X	X	X	X
Model 2	X	X	X	X	X	X	X	X
4250								
5210 Model G01	X	X	X	X	X	X	X	X
Model G02	X	X	X	X	X	X	X	X

Legend:

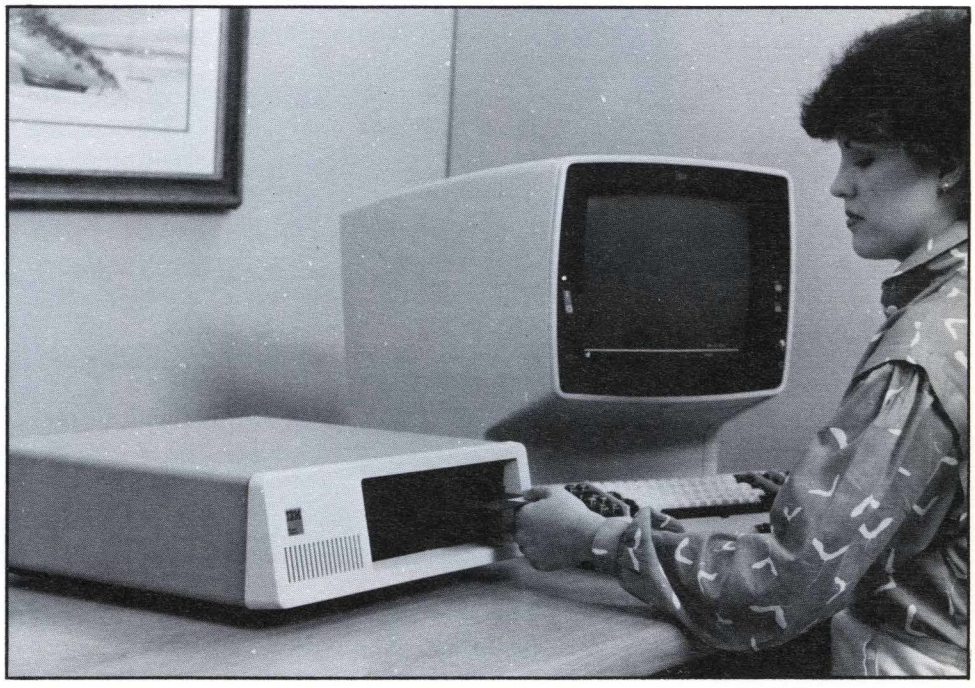
X Indicates that attachment is possible.

1 Base color mode only.

2 Control unit mode only.

Figure 6-2. 3276 Control Unit Display Stations and the Category A Terminals They Support (See Legend)

Chapter 7. Optional System Components



IBM 3270 Personal Computer Attachment

3270 Personal Computer Attachment

With the IBM 3270 Personal Computer Attachment, an IBM Personal Computer System Unit can be connected to an IBM 3278 or 3279 display and keyboard. The Attachment gives you the choice of working with the 3278's or 3279's host computer or using Personal Computer capabilities to operate as a personal computer. With Personal Computer capability added to the 3278 or 3279, you can use the wealth of programs designed for the Personal Computer and create application programs tailored to your needs, using BASIC or other Personal Computer programming languages. Both mainframe work and individualized computing can be accomplished without the clutter of two separate terminals on the same desk.

When the system is operating in the host-computer mode, your input is processed by the control unit and sent to the host. The System Unit does not interfere with the processing. When the system is operating as a Personal Computer, most IBM Personal Computer application programs running under DOS 1.1 or 2.1 can be used. Even though the results are displayed on the 3278 or 3279 screen, your input is processed by the Personal Computer System Unit. With this arrangement, both 3278 or 3279 host programs and personal computer programs can run concurrently.

Files from the host system and the System Unit can be transferred back and forth. Data transferred from a host application program can be formatted for use by IBM Personal Computer programs. Selected screens of information generated by the 3278's or 3279's host system can be transferred to the Personal Computer printer or to the the System Unit diskette.

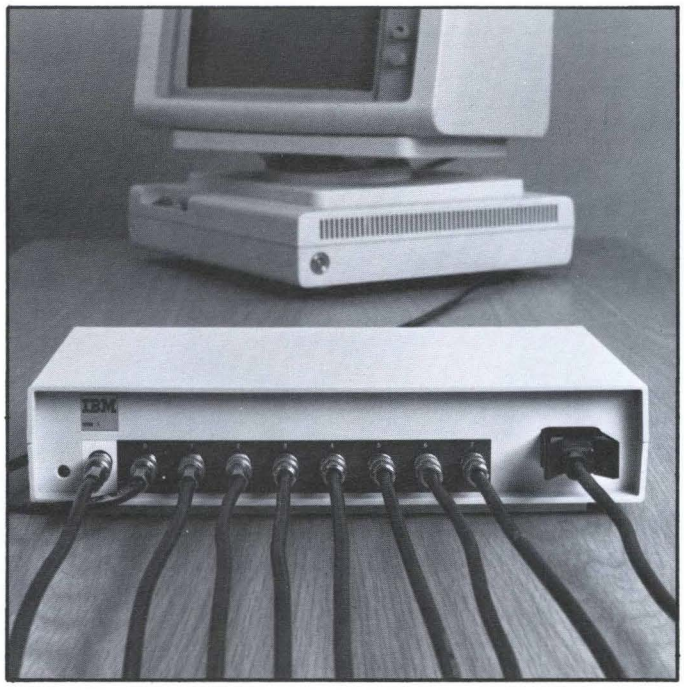
To attach to the 3278 or 3279 display, the IBM Personal Computer System Unit must have 64K bytes of storage; a 5 1/4-inch Diskette Drive Adapter and one Diskette Drive; and a Color/Graphics Monitor Adapter or Monochrome Display and Parallel Printer Adapter.

The **3278 or 3279 Personal Computer Adapter,** used for the 3278 or 3279, is installed by a service representative. This adapter provides:

- The capability of using either the 3278 (or 3279) or the Personal Computer screen image
- A path for transferring data between the host and the Personal Computer
- An input/output panel for a cable connection and test switch.

The **3270 Personal Computer Attachment Option** can be installed by the customer. The option provides:

- An adapter in the Personal Computer into which the 3278 or 3279 keyboard can be plugged
- Three cables to connect the Personal Computer to the 3278 or 3279 display and keyboard
- A cable distribution box
- A user's guide, including Personal Computer diskettes.



IBM 3299 Terminal Multiplexer

3299 Terminal Multiplexer

An intermediary between the 3274 Control Unit and the terminals in large or dispersed computer installations, the 3299 Terminal Multiplexer allows the terminals to be located at a greater distance from the 3274. Additionally, the 3299 eliminates the expense and planning involved in running individual coaxial cables from the 3274 Control Unit to each of the Category A terminals attached to it.

- Just one coaxial cable is required to connect the 3274 and a 3299, which can be located as far as 1500 meters (4,920 feet) from the 3274. Since each 3299 can attach a maximum of eight Category A terminals, four 3299s are required to attach 32 terminals to a 3274 Control Unit.

- Category A terminals can be attached to the 3299 by coaxial cable from as far as 1500 meters (4,920 feet) away. This means that the terminals can be 3000 meters (9,840 feet) from a 3274 Control Unit, double the distance allowed by directly cabled terminals.

- The 3299 can attach to all of the 3274 models, except Model 51C, equipped with 3299 Terminal Multiplexer support.

Chapter 8. Functional Control Capability

To use the functional control capability of the IBM 3270 Information Display System effectively, the system designer must consider the display image formats, transaction design, communication facilities, operator wait times, operator costs, channel loading, number of processor interruptions, number of telecommunication messages, and application program design. This is best done by selecting a typical transaction and evaluating the effect of functional control capability on system costs and performance. This evaluation, coupled with an assessment of operator control capabilities and considerations of system configuration, physical setup, and installation planning, will determine the best ratio between cost and performance for a display system.

Highlights of the functional control capabilities of the 3270 Display System include:

Format Control by Data Field: The 3270 Display System provides program control by data field. Each data field is established by a field-attribute character in the first position of the field. The field attribute character, written by the program, occupies a single nondisplayed character position at the beginning of a field and it serves as a visual separation between successive fields. A field may be started at any character position on the display screen. The attribute character can define:

- Protected or nonprotected fields: A protected field is one that cannot be modified by the display operator. An unprotected field is one in which the operator can enter or modify data.
- Alphanumeric or numeric fields: An alphanumeric field is an input field in which an operator can enter alphabetic, numeric, or symbol characters. A numeric field has special meaning for protected fields, data entry keyboards, and the Numeric Lock special feature.
- Character display (nondisplay, display, intensified display).
- Detectability or nondetectability (by use of a selector pen).
- Tab stop positions (the first character position of unprotected fields).

Note: A secondary effect of the protection and intensity attributes is the control of field color on the 3179 Color Display Station, the 3279 Color Display Station (all models) and the 3287 Printer, Models 1C and 2C when in base color mode. Fields can be displayed in either of the four colors: red, blue, green, and white. Fields can be printed in either of the four colors.

Format Control by Data Field and Character: Extended attribute codes control these additional characteristics:

- Extended highlighting (reverse video, blinking, and underscore)
- Extended color (seven colors)
- Programmed symbols

These attributes can be associated with fields or individual characters.

Alert: The alert function makes it easier for the system operator to do problem determination and failure isolation. The 3274 Control Unit sends unsolicited error messages to the host through the Network Communication Control Facility (NCCF) and the Network Problem Determination Application (NPDA) program products. The messages appear on the system operator's screen. Alert capability can be set up to show all the errors in the network by type, or just errors in a certain device. Alert is an SNA-only function, supported by microcode in the 3274.

Audible Alarm (Display Stations): An application program can activate the alarm. The User's Guide for a program tells whether the audible alarm sounds and, if so, the different reasons for sounding it. The audible alarm also sounds whenever the operator enters a character in the next-to-last character position on the screen.

Audible Alarm (3262): This audible alarm is activated by a code in the host program or by an error condition that occurs during printer operation. This alarm can be disabled by the operator.

Audible Alarm (3268, 3287, and 3289): This audible alarm alerts the operator to conditions requiring operator intervention. The operator can adjust the volume of the alarm.

BSC Copy Command (3274 Models 21C, 31C, 41C, 51C, and 61C): The host-initiated BSC Copy command may be used with these control units to direct data transfer from one terminal to another terminal attached to the same control unit. Upon accepting the command issued at the receiver (*to*) terminal, the control unit controls the data transfer from the sender (*from*) terminal. This eliminates the need to transfer the buffer data to and from the host.

BSC and SDLC Protocol: BSC protocol provides transmission reliability and comprehensive data checking. SDLC protocol, compared with BSC protocol, provides more extensive data-checking capability, results in greater transmission efficiency, and uses common-carrier facilities.

Channel Interface Speeds: Data transfer rates of 10,000 to 650,000 characters per second allow operation at the speed of the channel, which reduces response time.

Character Addressing: Addressing facilities permit starting a program write at any character position of the display screen. The write address can be set any number of times during an image write or update, or both. This allows selective writes to various noncontiguous areas of the display

screen. This facility also allows the modification of single- or multiple-field attribute characters as well as data characters.

Communication Line Speeds: Depending on the unit and its features, transmission rates of up to 57,600 bps are possible.

Erase Unprotected: The Erase Unprotected operation capability erases all unprotected data fields to null codes, and it positions the cursor in the first unprotected field of the screen.

Host-Initiated Local Copy Function (SNA only: 3274; 3276 Models 11, 12, 13, and 14; and 3276 Models 1, 2, 3, and 4 with the SDLC/BSC Switch Feature): The host can initiate a local copy function by sending a write-type command with the print bit set. This function permits data transfer from a 3178, 3179, 3180, 3278, 3279, or 3290 display station to any printer(s) attached to the same control unit. Printer assignment is controlled by a print authorization matrix in the control unit. This matrix specifies, for example, which displays may use a given printer. The matrix is loaded in the 3274 Control Unit from the host by the user-written application program or from the customized system diskette. Category A display stations can transfer data only to Category A printers. In the 3276, the matrix is determined by the physical attachment of the printers to the 3276 at power-on time. In this matrix, each display station is associated with the powered-on printer that has the next higher terminal address. Printer assignment can be changed at the attached display station keyboard.

Null Suppression: To reduce message lengths while providing maximum length input fields, 3270 Display System data fields can be erased to null codes under operator or program control. As an operator keys input data into a field, data codes replace null codes, leaving null codes in any unkeyed positions of the field. When a read modified message is sent to the host system, null codes are not transmitted as part of the message. This eliminates the transmission of unnecessary codes from unused positions of a field.

Operator-Initiated Local Copy Function (Non-SNA and SNA: 3274 and 3276): The operator initiates a local copy from a 3178, 3179, 3180, 3278, 3279, and 3290 display station to a printer(s) attached to the same control unit by pressing the Print key on the display station keyboard. As with the host-initiated local copy function (described above), printer selection is controlled by a print authorization matrix in the 3274 or 3276.

Program Tab: To decrease the length of a message transmitted to a display station, Program Tab permits writing data fields into successive unprotected data fields that were previously defined by a screen format. This eliminates the need to transmit control characters to specify the starting address of noncontiguous data, and so reduces the number of control characters required.

Protected Data Image Format: Protected data image format prevents the operator from entering data on specific areas of the screen. This allows field labels, instructions, and field control information to be written to a display station once and reused any number of times with variable input or

output data. For example, in file inquiry, a protected data image format can be written to the display station once, allowing later transmission of only the variable data records. Similarly, a protected data image format can be written to a display station once and can be used many times for repetitive key entry input transactions.

Read Modified Command: This command permits transfer of only operator-modified data fields with null codes suppressed. Because this operation reduces the message size by including essential data only, it also reduces traffic on the communication line and channel.

Remote General Poll: The control unit hardware has provisions to allow the program, with a general poll instruction, to interrogate all devices attached to the control unit with just one request. This reduces polling overhead and communication line traffic.

Repeat Characters: To decrease the number of data characters that must be transmitted to a display station, a single character, transmitted once, can be repeated from a starting address to an ending address.

Select: Display systems directly attached to a channel require a buffer load delay to prepare to execute a write or a read operation. A select operation allows a selector or block multiplexer channel to be released for other use during this delay time.

Short Read: Program access (PA) keys permit an operator to communicate with the program without transmitting unprotected data fields to the host system. Pressing one of these keys causes a short read operation that will only transmit the information necessary to identify which of the keys caused the attention. This eliminates the transmission of unnecessary data to the host system processor, thereby reducing traffic on the communication line and channel.

Write and Erase/Write Alternate Commands: These commands are used to load, format, and selectively erase device buffer data.

Write Structured Field Command: This command provides a general mechanism for conveying command-like functions, called *structured fields,* in the data stream to a terminal. These structured fields can be used by a program to perform various functions. For example, the program may interrogate a device to establish its characteristics, such as whether it supports color, or it may instruct the device on whether the attributes of color and highlighting should be included in data sent from the terminal to the host computer. It also establishes whether the operator can select these attributes from the display station keyboard.

Chapter 9. System Attachment

Local Attachment

Locally, a control unit is attached to a System/370 processor through a selector, multiplexer, or block multiplexer channel. The control unit is attached by cable to one of the eight control unit positions on the channel interface. From the host computer, the channel provides the control unit with both the data for display and printing, and the control information it needs to direct the operation of its attached display stations and printers. In their buffer storage, the display stations and printers store the data from the control unit for display or printing. The buffer permits simultaneous presentation of the display image and composition of a message from the keyboard at each display station.

Locally attached control units can be positioned up to 61 meters (200 feet) from the system channel, depending upon the system and channel configuration. Control units that can be locally attached are the 3274 Control Unit Models 21A, 21B, 21D, 31A, 31D, 41A, and 41D.

Either the System/370 or 4300 System can operate as a host computer to any of the 3270 Display Systems that are locally attached and using binary synchronous communications (BSC) protocol.

Remote Attachment

Remotely, the control unit and the system channel can communicate: (1)through a channel-connected communication controller or an integrated control unit using BSC protocol, or (2) through a communication controller using BSC or Synchronous Data Link Control (SDLC) protocol. The control unit communicates with intermediary devices by means of communication facilities known as data links:

- modems
- voice-grade channels
- equivalent facilities: telephone lines, microwaves, or satellites.

These control units can be remotely attached using BSC protocol:

- 3274 Control Unit Models 21C, 31C, 41C, 51C, and 61C
- 3276 Control Unit Display Station Models 1, 2, 3, and 4.

These control units can be remotely attached using SDLC protocol:

- 3274 Control Unit Models 21C, 31C, 41C, 51C, and 61C
- 3276 Control Unit Display Station Models 11, 12, 13, and 14
- 3276 Control Unit Display Station Models 1, 2, 3, and 4 if equipped with the SDLC/BSC Switch feature.

The System/370 and 4300 System can operate as a host computer to any 3270 Display Systems that are remotely attached and using BSC protocol.

The System/370, 4300 System, and 8100 Information System can operate as a host computer to any 3270 Display System that is remotely attached and using SDLC protocol.

Loop Attachment Using SDLC Protocol

A loop attachment increases the number of terminals and control units that can be attached to a host system. A 3270 Display System can be loop-attached to the 8100 Information System and any 4300 processor directly or through a data link. Directly attached loops operate at speeds up to 9,600 bits per second (bps); data-link-attached loops operate at 1200 or 2,400 bps. Both directly attached and data-link-attached loops can be used with the 8130 and 8140 Processors and the 8101 Storage and I/O Unit. The 3274 Control Unit Models 51C and 61C, and the 3276 Control Unit Display Station Models 11, 12, 13, and 14 can connect to both the directly attached and data-link-attached loops.

Communication Networks and Modems

Remotely attached 3270 Display Systems that use BSC or SDLC protocol operate in data half-duplex transmission mode on half-duplex or duplex communication facilities.

When using BSC protocol, the 3274 Models 21C, 31C, 41C, 51C, and 61C, and the 3276 Models 1, 2, 3, and 4 can attach to a multipoint nonswitched network.

When using SDLC protocol, the 3274 Models 21C, 31C, 41C, 51C, and 61C, and the 3276 Models 11, 12, 13, and 14 can attach to a multipoint nonswitched line network. The 3276 Models 11, 12, 13, and 14, and the 3274 Models 51C and 61C can also attach to switched lines. When two or more SDLC devices are multidropped and attached to a 3704, 3705, or 3725

Communication Controller, messages may be simultaneously transmitted and received by the 3704, 3705, or 3725 units on duplex facilities (multipoint operation). The 3704, 3705, or 3725 Communication Controller can operate in data full-duplex mode; however, the 3270 units operate only in data half-duplex mode.

The 3276 Models 1, 2, 3, and 4 can communicate with a host system via a data link using BSC or SDLC protocol if the SDLC/BSC Switch feature is installed.

The following external IBM modems can be used in remote systems that use BSC or SDLC protocol:

- 3863 Model 1 (2,400/1,200 bps)
- 3864 Model 1 (4,800/1,200 bps)
- 3865 Models 1 and 2 (9,600/4,800 bps)
- 3872 Model 1 (2,400/1,200 bps)

Switched-network backup (SNBU), with manual call and manual or auto answer, is available on the 3872 and 3875 modems. Four-wire SNBU operation with manual call and auto answer is available on the 3863 and 3865 modems.

Switched-network backup operation is initiated by the terminal operator. When, for example, a problem is experienced with a nonswitched line, the terminal operator can call the host system to reestablish a connection for operation.

A Digital Data Service (DDS) Adapter installed in the 3274 Models 21C, 31C, 41C, 51C, and 61C or in the 3276 interfaces with American Telephone and Telegraph's nonswitched Data-Phone[1] digital data service network.

In the 3274, the DDS Adapter can operate in BSC or SDLC data transmission at speeds of 2,400, 4,800, and 9,600 bps and, in SDLC, at 56,000 bps. In all models of the 3276, the DDS Adapter can operate at speeds of 2,400 and 4,800 bps; and in Models 11, 12, 13, and 14, the DDS Adapter can also operate at a speed of 9,600 bps.

A CCITT V.35 Interface feature for attachment to an external modem or other data circuit-terminating equipment (DCE), provides for speeds up to 56,000 bps for SDLC or 9,600 bps for BSC on the 3274 Models 21C, 31C, 41C, 51C, and 61C.

X.21 interface features permit SDLC operation at speeds of 2,400, 4,800, 9,600, or 48,000 bps through X.21 switched and nonswitched data communication equipment.

The X.25 adapter feature enables remote models to attach to host systems via an X.25 network, using SNA-defined protocols.

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1 Trademark of American Telephone and Telegraph Company.

Chapter 10. Programming Support

Here is a list of some of the operating systems, access methods, and products that support the IBM 3270 Information Display System. For details about them, contact your IBM marketing representative.

Operating Systems

- Airlines Control Program (ACP)
- Disk Operating System/Virtual Storage Extended (DOS/VSE)
- Multiple Virtual Storage/Extended Architecture (MVS/XA)
- Multiple Virtual Storage/System Product (MVS/SP)
- Operating System/Virtual Storage 1 (OS/VS1)
- Small System Executive (SSX)
- Small System Executive/Virtual Storage Extended (VSE)
- Virtual Machine/System Product (VM/SP)

Telecommunication Access Methods

- Advanced Communications Function/Virtual Telecommunications Access Method (ACF/VTAM) under DOS/VS, DOS/VSE, and OS/VS
- Advanced Communications Function/Telecommunications Access Method (ACF/TCAM) under OS/VS
- Advanced Communications Function/Virtual Telecommunications Access Method Entry (ACF/VTAME) under DOS/VSE
- Basic Telecommunications Access Method (BTAM) under OS, DOS, OS/VS, and DOS/VS

- Basic Telecommunications Access Method — Extended Support (BTAM-ES) under DOS/VSE
- Extended Telecommunications Modules (EXTM) feature of CICS/DOS/VS
- Telecommunications Access Method (TCAM) under OS and OS/VS
- Virtual Telecommunications Access Method (VTAM) under DOS/VS and OS/VS

Network Control

- Advanced Communications Function/Network Control Program (ACF/NCP)
- Emulation Program (EP)
- Network Communications Control Facility (NCCF)
- Network Logical Data Manager (NLDM)
- Network Performance Analyzer (NPA)
- Network Performing Analysis Reporting System (NETPARS)
- Network Problem Determination Application (NPDA)
- Virtual Machine/VTAM Communications Network Application (VM/VCNA)
- VM/Pass-Through Facility

Cross-Industry Program Products

- Financial Management System
- Instructional Systems (IIAS/IIPS)
- Interactive Financial System (IFS)
- Interactive Personnel System (INTERPERS)
- Planning, Control, and Decision Evaluation System (PLANCODE)
- Report Management and Distribution System (RMDS)
- Trend Analysis

Information Center

- A Departmental Reporting System II (ADRS II)
- APL Data Interface (APL/DI)
- APL Financial Planning System (APL/FPS)
- GRAPHPACK Full Screen Interface
- Query-by-Example (QBE)
- VS APL (A Programming Language)

Development Center

- Development Management System/CICS/VS (DMS/CICS/VS)
- Development Management System/Cross System Product (DMS/CSP)
- Entry Level Interactive Application System (ELIAS)
- IMS Application Development Facility II (IMSADF II)
- Screen Definition Facility/Customer Information Control System (SDF/CICS)

Office Systems

- Advanced Text Management System III (ATMS III)
- Document Composition Facility (DCF)
- Host Display View Facility (HDVF)
- Integrated Processing of Data and Text (IPDT)
- Professional Office System (PROFS)
- Storage Information Retrieval System (STAIRS)

Data Base Data Communication Systems

- CICS/DC Aids
  - CICS/VS Online Test/Debug II (OLTD II)
  - CICS Source Program Maintenance Online II (SPM II)
- Customer Information Control System/VS (CICS/VS)
- DB/DC Data Dictionary
- IMS/VS Aids
  - Batch Terminal Simulator
- Information Management System/VS Data Communications (IMS/VS-DC)

Interactive Programming Support

- Conversation Monitor System (CMS)
- Interactive System Productivity Facility (ISPF)
- Time Sharing Option (TSO)
- TSO Extensions (TSO/E)
- Virtual Storage Extended/Interactive Computing and Control Facility (VSE/ICCF)
- Virtual Storage Personal Computing (VSPC)

Other Program Products

- Communication Oriented Production Information Control System (COPICS)
- Display console support for local 3270 displays and printers used as operator's consoles through Device-Independent Display Operator Console Support (DIDOCS) and Status Display Support OS and OS/VS
- Distributed Processing Control Executive (DPCX)
- Distributed Processing Programming Executive (DPPX)
- Downstream Load Utility (DSLU)

- Editor (XEDIT)
- Graphical Data Display Manager (GDDM)
- 3270-PC Graphics Applications System
- Timesharing Option (TSO) of TCAM and VTAM
- 3-Dimensional Presentation Graphics Facility (3D-PGF)
- 3270 Personal Computer File Transfer Program

Chapter 11. Installation Planning and Customer Setup

The design and physical characteristics of the 3270 Display System make the components an attractive addition to an office or a computer room. For details on workspace considerations, site preparation, cables and connectors, and machine specifications, refer to the section, "Further Reading," at the back of this book. When planning your installation, be sure to consider using the 3299 Terminal Multiplexer to significantly decrease the amount of cable required.

Certain units in the 3270 Display System are designated for customer setup. These units can be set up as soon as they arrive, reducing the time spent waiting for the units to become operational. Because they are customer setup units, the components can be easily relocated.

The setup process consists of two steps: physical setup and checkout. The setup instructions are shipped with the units. Once the units are unpacked and placed in position, customer personnel capable of operating the units should be able to set them up and check them out. These are the customer setup units:

- 3274 Control Unit, Models 21C, 31C, 41C, 51C, and 61C
- 3270 Personal Computer Attachment
- 3276 Control Unit Display Station
- 3178 Display Station
- 3179 Color Display Station
- 3180 Display Station
- 3270 Personal Computer
- 3270 Personal Computer/G and /GX
- 3278 Display Station
- 3279 Color Display Station
- 3290 Information Panel
- 3262 Line Printer
- 3268 Printer
- 3287 Printer
- 3289 Printer
- 4214 Printer
- 4250 Printer
- 5210 Printer
- 3299 Terminal Multiplexer

For further information about customer setup, see your IBM marketing representative.

Chapter 12. Problem Determination

To ensure that more computer time is available to the customer, the problem determination procedures and recovery routines for the 3270 units are designed to be easy to use.

Problem determination procedures are provided for the 3274 and 3276 control units, as well as for the 3178, 3179, 3180, 3278, 3279, and 3290 display stations, and the 3262, 3268, 3287, 3289, 4214, 4250 and 5210 printers. Customer Problem Analysis and Recovery procedures for the operator are provided with each 3178, 3179, 3180, and 3290 display station. Each 3278 and 3279 keyboard includes a problem determination guide. For the IBM 3270 Personal Computer Attachment, diagnostic aids are available on a diskette. The *IBM 3270 Personal Computer Control Program User's Guide and Reference* and the *3270 Personal Computer Graphics Control Program User's Guide* contain two appendixes that describe how to isolate and solve software problems.

At the host level, the following IBM software products help provide effective problem determination:

Network Problem Determination Application (NPDA) 5735-XX8: Working with the Network Communications Control Facility (NCCF) 5735-XX6 (a program that provides communication and data base facilities for collecting, storing, and retrieving data on network errors), this program collects, organizes, and displays error statistics, as well as data about communication controllers, transmission lines, control units, and terminals. NPDA helps the NCCF operator locate a component causing problems. The supported SNA environments include VTAM, TCAM, ACF/VTAM, and ACF/TCAM with NCP under OS/VS, and also ACF/VTAM and ACF/VTAME with NCP under DOS/VSE.

Display Exception Monitoring Facility (DEMF): This software tool for network problem determination and isolation enhances the availability of the 3274 and 3276 control units when operating in BSC mode.

Network Error Management Facility (NEMF) OS/DOS/CICS 5798-DAW: This program collects, organizes, and displays error statistics and data about communication controllers, transmission lines, control units, and terminals. It also helps locate a component causing problems. The supported communication environments include BTAM and TCAM operating under OS/VS, and BTAM under DOS/VS. When using SNA

protocol, supported environments include EXTM and ACF/VTAM with NCP under DOS/VS. (All environments require CICS.)

Facility Error Recognition System (FERS): This facility permits logging of 3270 Display System and transmission line statistics at the host. The data retrieved through FERS is used in problem determination for the suspected 3270 Display System.

List of Abbreviations

ACF/TCAM	Advanced Communications Function/Telecommunications Access Method
ACF/VTAM	Advanced Communications Function/Virtual Telecommunications Access Method
ACF/VTAME	Advanced Communications Function/Virtual Telecommunications Access Method Extended
APL	A Programming Language
bps	Bits per second
BSC	Binary synchronous communications
BTAM	Basic Telecommunications Access Method
BTAM-ES	Basic Telecommunications Access Method - Extended Support
CCITT	The International Telegraph and Telephone Consultative Committee
CICS	Customer Information Control System
cps	Characters per second
DCE	Data circuit-terminating equipment
DDS	Digital Data Service
DOS	Disk Operating System
	EBCDIC Extended binary-coded decimal interchange code
EIA	Electronic Industries Association
mm	millimeter
NCP	Network Control Program
OS	Operating System
RPQ	Request for price quotation
SDLC	Synchronous Data Link Control
SNA	Systems Network Architecture
TCAM	Telecommunications Access Method
TSO/VTAM	Time Sharing Option for the Virtual Telecommunications Access Method
TCU	Transmission control unit
VS	Virtual storage
VSE	Virtual Storage Extended
VSPC	Virtual Storage Personal Computing
VTAM	Virtual Telecommunications Access Method
VTAME	Virtual Telecommunications Access Method Extended

Glossary

This glossary includes definitions developed by the American National Standards Institute (ANSI) and the International Organization for Standardization (ISO). The asterisk identifies material reproduced from the *American Dictionary for Information Processing*, copyright 1977 by the Computer and Business Equipment Manufacturers Association. The label (ISO) indicates the definition is drawn from published sections of the *ISO Vocabulary of Data Processing*.

A

access method. A technique for moving data between main storage and an input/output device.

adapter. In 3270, hardware that is generally required for transferring data and commands between the processor and an I/O device.

alphanumeric. Pertaining to a character set that contains letters, digits, and, usually, other characters such as punctuation marks.

American National Standard Code for Information Exchange X3.4-1968. (ASCII) A standard code consisting of control characters and graphic characters; used for information interchange between data processing and communication systems and associated equipment.

application mode. The operating mode of the 3270 Personal Computer keyboard when it is logically attached to one of the following: a host computer session, the personal computer session, or a notepad session.

autokeying. A function of the 3270 Personal Computer that records frequently used groups of keystrokes and plays them back at designated locations on the screen.

B

binary synchronous communication. (BSC) Communication using binary synchronous transmission; that is, data transmission in which synchronization of characters is controlled by timing signals generated at the sending and receiving stations.

block-multiplexer channel. A multiplexer channel that interleaves bytes of data. Contrast with *selector channel.*

C

channel interface. The communication link between the channel unit and its attached control units, consisting of shared control and a data line.

character set. A defined collection of characters.

cluster control unit. A device, such as the 3274 Control Unit, that can control the input/ output operations of more than one terminal, such as a group (cluster) of 3278 Display Stations.

communication controller. A type of communication control unit whose operations are controlled by a program stored and executed in a unit. It manages the details of line control and the routing of data through a network. Examples are the IBM 3704, 3705 and 3725 Communication Controllers.

communication facility. Anything used or available for use in furnishing data communication service.

customizing procedure. The multistep process, performed at the 3274 Control Unit, of constructing a configuration image of the 3270 subsystem.

D

data link. The physical connection and the connection protocols between units that exchange data over a telecommunication line.

data-link-attached loop. A data communication transmission loop used to attach I/O devices to the system by a data link facility rather than directly by cables. Contrast with *directly attached loop.*

data stream. All data transmitted through a channel in a single read or write operation to a display station or printer.

directly attached loop. A loop that connects to the loop adapter by cables, rather than through a data link facility, and allows attachment of a variety of I/O devices. Contrast with *data-link-attached loop.*

diskette. A thin, flexible magnetic disk and a semi-rigid protective jacket in which the disk is permanently enclosed.

distributed function terminal mode. An operational mode that allows multiple concurrent logical terminal sessions.

document mode. A terminal supporting Entry Assist is said to be in "document mode" when the operator has activated the Entry Assist functions.

duplex*. (1) (ISO) In data communication, pertaining to a simultaneous two-way independent transmission in both directions. Synonymous with full duplex. (2) Contrast with *half-duplex.*

E

entry assist. A function that allows the display station to operate much like a typewriter, providing facilities such as margins, tabbing, a bell to signal the end of the line, word deletion, and more.

H

half-duplex*. (1) In data communication, pertaining to an alternate, one-way-at-a-time, independent transmission. (2) Contrast with *duplex.*

hardware*. (1) (ISO) Physical equipment used in data processing, as opposed to computer programs, procedures, rules, and associated documentation. (2) Contrast with *software.*

host computer. A large, central processor that provides services such as computation, data base access, or special programs or programming languages.

I

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.

K

keypad. For the 3290 Information Panel, a separately housed group of keys available for either numeric data entry or program function applications.

L

leased line. See *nonswitched line.*

M

modem* (modulator-demodulator). A device that modulates and demodulates signals transmitted over data communication facilities

multiplexer channel. A channel designed to operate with a number of I/O devices simultaneously. Several I/O devices can transfer records at the same time by interleaving items of data.

N

nonswitched line. A connection between a remote terminal and a host system that does not have to be established by dialing. Synonymous with leased line.

notepad. For the 3270 Personal Computer, the session that contains notes the user makes.

P

program function key. A key that passes a signal to a program to call for a particular operation.

S

selector channel. An I/O channel designed to operate with only one I/O device at a time. Once the I/O device is selected, a complete record is transferred one byte at a time.

software*. (1) (ISO) Computer programs, procedures, rules, and possibly associated documentation concerned with the operation of a data processing system. (2) Contrast with *hardware*.

switched line. A telecommunication line in which the connection between the computer and a remote station is established by dialing.

Synchronous Data Link Control. (SDLC) A discipline for managing synchronous, code-transparent, serial-by-bit information transfer over a communication channel. Transmission exchanges may be duplex or half-duplex over switched or nonswitched data links. The communication channel configuration may be point-to-point, multipoint, or loop.

Systems Network Architecture. (SNA) The description of the logical structure, formats, protocols, and operational sequences for transmitting information units and controlling the configuration and operation of networks.

T

time-sharing. The interleaved use of a device's operating time that allows two or more concurrent uses of the device.

transmission control unit. (TCU) A communication control unit whose operations are controlled only by programmed instructions from the computing system to which the unit is attached; no program is stored or executed in the unit. Contrast with communication controller.

W

window. On the IBM 3270 Personal Computer, the "openings" on the screen through which the application data is viewed. The window can be the size of the full screen or as small as one character.

work station control mode. The master control function of the 3270 Personal Computer from which the control program functions are initiated.

Further Reading: IBM Publications

A full range of publications is available to use with the 3270 Information Display System. These publications explain how to plan for, set up, install, program, and use the components. For a summary listing of all 3270 publications, see *IBM 3270 Display System Library User's Guide,* GA23-0058. These publications provide an in-depth discussion of specific aspects of the system mentioned in the product descriptions:

Color Applications

IBM 3270 Information Display System: Color and Programmed Symbols, GA33-3056. Details of base color, extended highlighting, extended color, and programmed symbols capacities, including programming support.

3179 Color Display Station Description, GA18-2177.

3179 Color Display Station Operator's Guide, GA18-2180.

3279 Color Display Station Operator's Guide, GA33-3057.

3287 Printer Models 1C and 2C Component Description, GA27-3229.

Configurations and Features

3270 Information Display System: Feature Description, GA23-0113.

Installation Planning and Setup

IBM 3270 Information Display System: Installation Manual -- Physical Planning, GA27-2787. Information on workspace considerations, site preparation, cables and connectors, and machine specifications.

IBM 3179 Color Display Station Description, GA18-2177.

IBM 3179 Color Display Station Operator Guide, GA18-2180.

IBM 3180 Model 1 Display Station Introduction and Preinstallation Planning Manual, GA21-9465.

IBM 3270 Information Display System Library User's Guide, GA23-0058. Lists installation and planning manuals for specific models.

Keyboards

IBM 3270 Information Display System: Character Set Reference, GA27-2837. Complete description of the keyboards available for various national languages.

3178 Display Station Operator Reference Guide, GA18-2128.

3179 Color Display Station Operator Guide, GA18-2180.

3180 Display Station Model 1 User's Guide, GA21-9468.

3180 Keyboard Template, GX21-9298.

3270 Personal Computer Control Program User's Guide and Reference, SC27-0103.

3270 Personal Computer Online Tutorial, SA23-0163.

3270 Information Display System Keyboard Definition Utility User's Guide, GA23-0187. Introductory and procedural information for defining unique keyboard layouts for displays with modifiable keyboards.

3276 Control Unit Display Station Operator's Guide, GA18-2040.

3278 Display Station Operator's Guide, GA27-2890.

3279 Color Display Station Operator's Guide, GA33-3057.

3290 Information Panel Description and Reference, GA23-0021.

3290 Information Panel Operator's Guide, GA23-0143.

Operator Comfort

Human Factors of Workstations with Display Terminals, G320-6102.

Problem Determination

DOS/CICS User's Guide, G229-7030. FERS configuration, implementation, and operation information.

OS/CICS User's Guide, G229-7029. FERS configuration, implementation, and operation information.

OS/VS Display Exception Monitoring Facility (DEMF) User's Guide, GC34-2003. DEMF requirements for software configuration, communication facility, and operating procedures.

Network Communications Control Facility (NCCF) General Information, GC27-0429.

Network Problem Determination Application (NPDA) General Information, GC34-2010.

3270 Facility Error Recognition System (FERS) Service Aid Description, G229-7029. FERS configuration, implementation, and operation information.

Programming

3270 Data Stream Programmer's Reference, GA23-0059.

3274 Control Unit Description and Programmer's Guide, GA23-0061.

Programmed Symbols

IBM 3270 Information Display System: Color and Programmed Symbols, GA33-3056.

3287 Printer Models 1C and 2C Component Description, GA27-3229.

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An Introduction to the
IBM 3270
Information Display System

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