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IBM 5250 Information Display System
IBM 5251 Display Station
IBM 5252 Dual Display Station
IBM 5256 Printer
Introduction

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INTRODUCTION

Preface

This publication describes the IBM 5250 Information Display System. The 5250 consists of the 5251 Display Station, 5252 Dual Display Station, and the 5256 Printer. These work stations attach directly to System/34 or to a 5251 Display Station that is capable of remote communications with System/34 via the SNA/SDLC (systems network architecture/synchronous data link control) line discipline. The flexibility of configuring these work stations allows the 5250 Information Display System to be placed in most areas that require the services of a computer center.

The objective of this publication is to help the reader achieve a general understanding of the display system and how the display system can expand the capabilities of a data processing system.

This publication is divided into five chapters:

- Chapter 1 provides a general introduction to the 5250 Information Display System.

- Chapter 2 describes each machine and the special features.

- Chapter 3 discusses the functional capabilities.

- Chapter 4 describes how a display system can be used in data processing applications.

- Chapter 5 provides some additional information, such as planning the installation, setting up the machines, reliability and serviceability.

The reader is expected to have a basic knowledge of data processing and data communications, but prior knowledge of display systems is not a requirement.

Related Publications

- *IBM 5250 Information Display System Installation Manual—Physical Planning*, GA21-9277

- *IBM 5251 Model 11 Display Station Setup Procedure*, GA21-9286

- *IBM 5251 Display Station Operator's Guide*, GA21-9248

- *IBM 5256 Printer Setup Procedure*, GA21-9290

- *IBM 5256 Printer Operator's Guide*, GA21-9260

- *IBM 5251 Display Station Keyboard Template Assignment Sheet and Display Screen Layout Sheet*, GX21-9271

- *IBM System/34 Introduction*, GC21-5153

- *IBM Data Communication Concepts*, GC21-5169

- *Form Design Reference Guide for Printers*, GA24-3488

Contents

The IBM 5250 Information Display System

The 5250 Information Display System is a family of work stations that brings the capabilities of System/34 to the user. The 5250 system offers tabletop display stations and printers that are designed for interactive data entry and inquiry applications. The system consists of the 5251 Display Station, the 5252 Dual Display Station, and the 5256 Printer. These work stations can be set up in areas away from System/34; such as the sales counter, order entry department, and shipping departments.

The 5250 system offers a variety of features allowing you to tailor the 5250 Information Display System and System/34 to your current data processing needs and to plan for additional display products as your business grows.

Highlights of the 5250 Information Display System

The display stations of the 5250 Information Display System offer:

- Direct attachment to System/34 or remote communications with System/34 via the SNA/SDLC line protocol.

- Local operation through a maximum length of 1,525 meters (5,000 feet) of cable.

- Remote data communications up to 9,600 bits per second.

- A 960 or 1,920 character display.

- The capability to display both uppercase and lowercase alphabetic letters.

- One or two movable keyboards with a key arrangement similar to a standard typewriter.

- A numeric key pad on the keyboard for rapid entry of numeric data.

- The capability to select up to 24, programmable, command functions.

- A security Keylock feature and, under program control, the capability to enter data without the data being displayed.

- A Cluster feature for the direct attachment of additional work stations.

- A Cable Thru feature for the connection in series with other directly attached work stations.

The 5256 Printer offers:

- A printing speed of 40, 80, or 120 characters per second.

- The capability of direct attachment to a System/34 or a display station with a Cluster feature.

- The capability to connect in series with other directly attached work stations.

- Bidirectional serial matrix printing.

- Full look-ahead capability for optimized throughput.

- The capability of being either a work station printer or system printer.

- A maximum print line of 132 characters.

- The capability to print uppercase and lowercase letters.

- The capability of using individual or continuous forms.

- The capability to print on continuous forms that have one to six parts.

- A print position spacing of 10 characters per inch.

- A selectable line spacing of 6 or 8 lines per inch.

- An Audible Alarm feature.

Advantages of a Display System

The IBM 5250 Information Display System can be located away from System/34 in areas that often require the services of the computer center. A display system brings the system to the user, which enables the user to enter data directly into the system, eliminating unnecessary transcribing and transferring forms and documents. As a result, current information is available when and where it is needed.

The display system reduces errors in the handling of data. The area operator who first enters the data can more easily discover data entry errors and is more qualified to correct them than personnel in the computer center. This concept also reduces the clerical activities at the computer center.

Some processing activity at the computer center is eliminated because a remote display station can itself process keystrokes and fields according to your program requirements. This processing is done by a remote display station to:

- Relieve the System/34 processing unit of highly repetitive and burdensome operations.

- Reduce the amount of data and control information transferred between the processing unit and the remote display station.

- Improve the speed of response in accepting and processing keystrokes.

- Improve the ability to provide timely feedback to the operator, especially in the case of operator or machine errors.

A Sample Configuration

Your business needs should determine the number of display stations and printers for the System/34. You can begin with a minimum configuration in a centralized environment. Later, to provide maximum efficiency for each function the System/34 must serve, you could decentralize the data processing operation by placing display stations and printers in the user's areas throughout the organization. The configuration can be expanded as the data processing needs of your business change and grow.

Figure 1 shows a sample configuration. The upper section shows work stations that are directly attached to System/34. This arrangement consists of a system console and data entry station, system printer, and a dual display station in the computer center for centralized data entry. A printer is directly attached through the dual display station's Cable Thru feature to System/34. This feature, which should be considered for all directly attached work stations to allow relocation flexibility, can save cable expenses; especially when the cable length approaches 1,525 meters (5,000 feet).

For decentralized interactive data entry or communications with System/34 at distances greater than 1,525 meters (5,000 feet), the display stations capable of remote communications use the SNA/SDLC line discipline to communicate with System/34. These display stations can be equipped with a Cluster feature, which allows them to control directly attached work stations.

Directly attached work stations can be connected to System/34 or to a display station's Cluster feature by two methods. One method, as shown in the lower right section of Figure 1, is to individually cable each work station back to the Cluster feature. Another method, as shown in the lower left section, allows the cable from one work station to be connected to another work station, and so forth, in series, back to the Cluster feature. These work stations must have the Cable Thru feature to be connected in series. The Cable Thru feature and Cluster features are described in the *Features* section of this manual. The *Applications* chapter describes the uses for the 5250 Information Display System.

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System Console and
Data Entry Station

Data Entry Stations
with Cable Thru
Feature in Computer
Room

System Printer

System/34

Work Station
Printer in
Computer Room

Remote Inquiry
Station with
Cluster Feature
at Sales Counter

Remote Inquiry
Station with
Cluster Feature
at Sales Counter

Data Entry Stations
with Cable Thru
Feature in Order
Entry Department

Printer in
Shipping
Department

Data Entry Station in
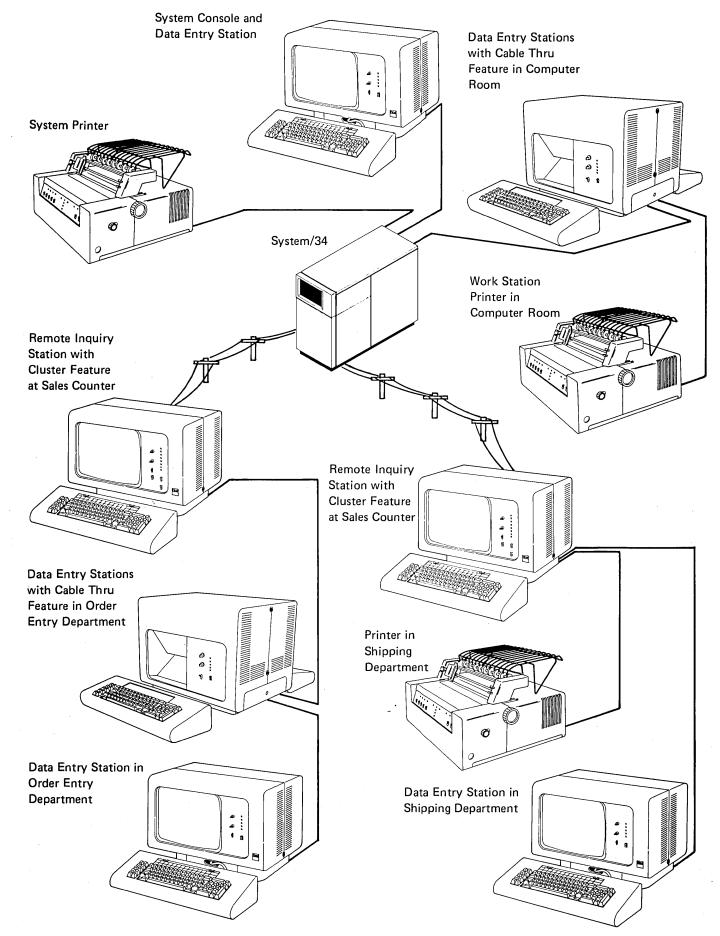Order Entry
Department

Data Entry Station in
Shipping Department

Figure 1. A Sample Configuration for the IBM 5250 Information Display System

A general description of the IBM 5250 Information Display System, its advantages, and some of the uses of the display station and printer were described in the previous chapter. This chapter gives detailed descriptions of the 5251, 5252, and 5256, and describes the features.

- The 5251 Display Station is offered in four models:
  - Model 1 is a directly attached work station with a 960-character display.
  - Model 2 is a remote communicating work station with a 960-character display.
  - Model 11 is a directly attached work station with a 1,920-character display.
  - Model 12 is a remote communicating work station with a 1,920-character display.

- The 5252 Dual Display Station is a directly attached work station with two keyboards and two 960-character displays.

- The 5256 Printer is a directly attached serial matrix printer and is offered in three models:
  - Model 1 prints at a maximum rate of 40 characters per second.
  - Model 2 prints at a maximum rate of 80 characters per second.
  - Model 3 prints at a maximum rate of 120 characters per second.

Directly attached display stations and printers can be connected by twinaxial cable to:
  - A serial port on the System/34
  - A 5251 Model 2 or 12 with a Cluster feature
  - Another 5251 Model 1 or 11 with the Cable Thru feature

Twinaxial cable is a shielded cable with two conductors that can be used indoors or outdoors. You may purchase preassembled cables from IBM or assemble your own from bulk cable and connectors. Cable information is given in the *IBM 5250 Information Display System Installation Manual — Physical Planning*, GA21-9277.

5251 MODELS 2 AND 12 DISPLAY STATION (REMOTE COMMUNICATIONS)

Figure 2 shows the 5251 Model 12 Display Station. The Model 12 and the Model 2 (which resembles the Model 12) are single keyboard display stations that communicate via communications facilities with a System/34. The Model 2 displays up to 12 lines of information with 80 characters each and the Model 12 displays up to 24 lines of information with 80 characters each. These display stations use the SNA/SDLC line discipline and operate in half-duplex mode on point-to-point switched or nonswitched facilities, or multipoint nonswitched facilities. Both models provide display control and highlighting characteristics as described in *Chapter 3 Functional Capabilities.*

These display stations have one keyboard, a display screen, display indicators, and a control panel. The keyboard is the same for all models of the 5251 and 5252 and is described in the *Features* section of this chapter.

A cursor, which is normally visible on the display when power is on, resembles a high intensity underscore and can be positioned anywhere on the display either manually by operator keying or automatically by the system program. The cursor indicates where the next character can be entered. The display station character set consists of uppercase and lowercase letters, numerics, and special symbols. Each character is displayed in an 8 by 16 dot matrix.

Five display indicators keep the operator constantly informed of the operational status of the display station. These indicators appear on the display next to the permanent legends. A bright rectangle indicates the active status and a dash indicates the inactive status. Generally, if the rectangle appears next to:

System Available, data can be entered from the keyboard.

Message Waiting, a message has been sent from the system.

Keyboard Shift, the keyboard is in upper shift.

Insert Mode, the keyboard is in Insert mode.

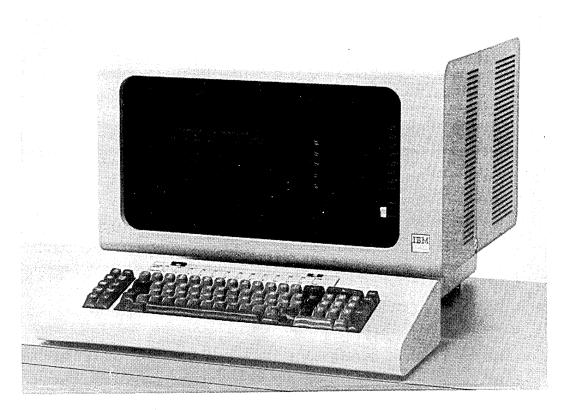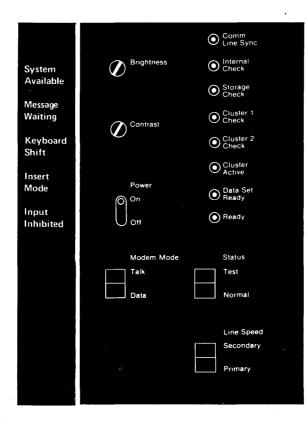Input Inhibited, data cannot be entered from the keyboard.

Figure 2. IBM 5251 Model 12 Display Station

The controls for adjusting display screen brightness and contrast (between normal and high-intensity fields) for the range commonly required for different lighting conditions are on the control panel.

This panel also contains lights that provide communications and Cluster feature status information. These lights generally indicate when:

- The display station is ready for use.

- The data communications equipment is ready to communicate with System/34.

- Communications is active between the Model 2 or 12 and any directly attached display stations or printers.

Arrangements for the communications services must be made by the customer. You can refer to the *IBM Data Communication Concepts*, GC21-5169, manual for general information about data communications. This manual also describes the components of a data communications system, explains the benefits of data communications, and describes how data communications can be used with data processing.

The next illustration shows several conventional methods for connecting the System/34 to the Model 2 or 12 by nonswitched communications lines. It also shows the 5251 Model 2 or 12 with the Dual Cluster feature. The Cluster or Dual Cluster feature allows the Model 2 or 12 to control the 5250 Information Display System's directly attached display stations and printers.

System/34

```
                    ┌──────────────┐  ┌──────────────┐  ┌──────────────┐
                    │ EIA          │  │ 1200 bps     │  │ DDS          │
                    │ Interface    │  │ Integrated   │  │ Adapter      │
                    │              │  │ Modem        │  │              │
                    └──────┬───────┘  └──────┬───────┘  └──────┬───────┘
                    ┌──────┴───────┐         │          ┌──────┴───────┐
                    │              │         │          │ Channel      │
                    │ Modem        │         │          │ Service      │
                    │              │         │          │ Unit         │
                    └──────────────┘         │          └──────────────┘

                    ┌──────────────┐         │          ┌──────────────┐
                    │ Modem        │         │          │ Channel      │
                    │              │         │          │ Service      │
                    │              │         │          │ Unit         │
                    └──────┬───────┘  ┌──────┴───────┐  └──────┬───────┘
                    ┌──────┴───────┐  │ 1200 bps     │  ┌──────┴───────┐
                    │ EIA          │  │ Integrated   │  │ DDS          │
                    │ Interface    │  │ Modem        │  │ Adapter      │
                    └──────────────┘  └──────────────┘  └──────────────┘
```

┌─────────────────────────────────┐
│ 5251 Model 2 or 12   │
│ Display Station   │
├─────────────────────────────────┤
│ Dual Cluster Feature   │
└─────────────────────────────────┘

┌──────────────────┐   ┌──────────────────┐
│ 5251 Model 1   │   │ 5251 Model 11   │
│ Display Station │   │ Display Station │
└──────────────────┘   └──────────────────┘

┌──────────────────┐   ┌──────────────────┐
│ 5252 Dual   │   │ 5256 Printer   │
│ Display Station │   │   │
└──────────────────┘   └──────────────────┘

5251 MODELS 1 AND 11 DISPLAY STATION (DIRECT ATTACH)

Figure 3 shows the 5251 Model 11 Display Station. The Model 11 and the Model 1 (which resembles the Model 11) are fully buffered single keyboard display stations for interactive data entry and inquiry applications at locations that require a single display work station. They attach directly to a System/34 or to a 5251 Model 2 or 12 Display Station.

The Model 1 displays up to 12 lines of information with 80 characters each and the Model 11 displays up to 24 lines of information with 80 characters each. Both models provide display control and highlighting characteristics as described in *Chapter 3 Functional Capabilities*.
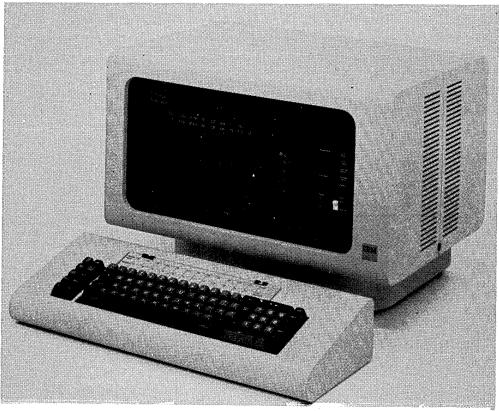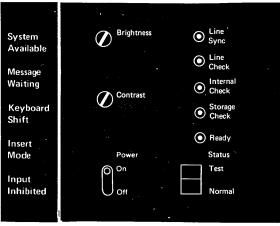

Figure 3. IBM 5251 Model 11 Display Station

The Models 1 and 11 like the Models 2 and 12, have one keyboard, a display screen, display indicators, and a control panel. The display indicators and control panel lights keep the operator informed of the display station's operational status.

5252 DUAL DISPLAY STATION (DIRECT ATTACH)

The 5252 Dual Display Station is shown in Figure 4. This display station is designed for use by two operators in high-production data entry applications or where multiple display stations are required at a specified location. The 5252 attaches directly to a System/34 or to a 5251 Model 2 or 12 Display Station.

A dual display station has two movable keyboards that are connected by a short cable to a common display unit. This display unit is divided in half logically and optically into two independent work stations, which allows each operator to view a separate 960-character display with up to twelve lines of 80 characters each.

The 5252 provides the same display control and highlighting of individual fields as the 5251 and also uses the same keyboard. The similarities between the 5251 and 5252 keyboard, display, and control panel allows your operators to use either work station and maintain effective keying rates.
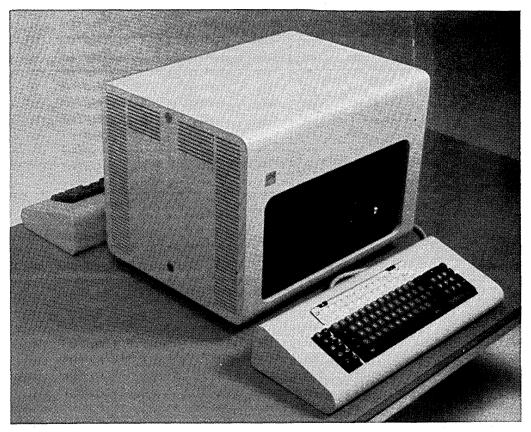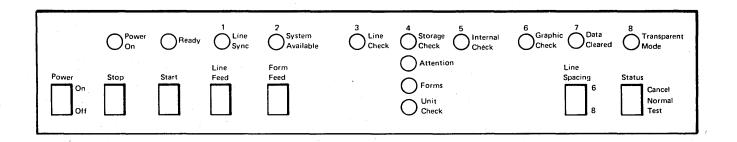

Figure 4. IBM 5252 Dual Display Station

5256 PRINTER (DIRECT ATTACH)

The 5250 Information Display System can use the 5256 Printer to print information that is displayed at the 5251 or 5252 display station, or output that comes from a system program. The 5256 Printer, shown in Figure 5, is a fully buffered, 132-position, serial matrix printer with front panel controls and an easy-to-remove forms tractor. The printer attaches directly to System/34 or a 5251 Model 2 or 12 Display Station with a cluster feature.

The average printing rate depends on the format of the printed data on the page. The 5256 prints bidirectionally and has a full look-ahead capability. This capability reduces the print head movement by not requiring the print head to move to a margin before printing. Instead, the print head continues to print while moving in either direction, thus increasing throughput.

The switches and lights are on the front of the printer. There are 13 lights, a Power switch, a Status switch, and five functional switches including a Line Spacing switch to select either 6 or 8 lines per inch. When the Status switch is set to Test, the lights numbered 1 through 8 take on alternative meanings and are used for problem determination.

Continuous or individual forms can be used on the 5256 Printer. The printer accepts forms of up to six parts, but forms consisting of more than four parts should be tested under operating conditions to determine suitability of feeding and legibility.

Continuous forms can be 3 to 15 inches wide and individual forms can be 6 to 14.5 inches wide. Refer to the *Form Design Reference Guide for Printers*, GA24-3488, for general form-design information, such as, form length, weight, fastenings, and other form-related items that should be considered when forms are designed.

The forms tractor is required for continuous forms, but can be easily removed when the printer is being used for individual forms. A Forms Stand feature permits stacking of continuous forms above floor level.
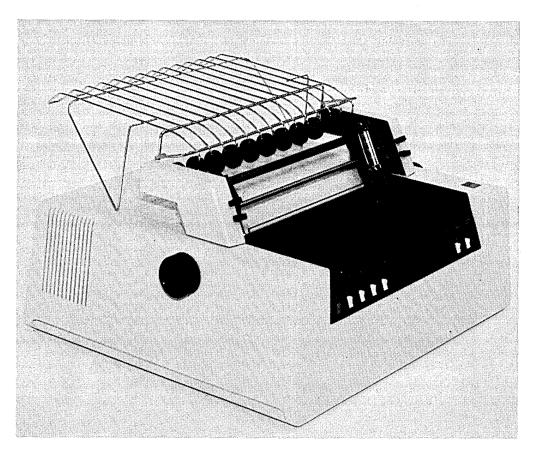
Figure 5. IBM 5256 Printer

FEATURES

This section describes the features for the 5250 Information Display System.

The following chart shows the standard functions and features for the 5250 Information Display System. Standard functions are described in *Chapter 3 Functional Capabilities*.

Standard Function or Special Feature	5251 Display Station Models				5252 Dual Display Station Model	5256 Printer Models
	1	2	11	12	1	1, 2, and 3
Audible Alarm	Std	Std	Std	Std	Std	Feat
Cable Thru	Feat	N/A	Feat	N/A	Feat	Feat
Cluster	N/A	Feat	N/A	Feat	N/A	N/A
Communications	N/A	Std	N/A	Std	N/A	N/A
DDS Adapter	N/A	Feat	N/A	Feat	N/A	N/A
EIA Interface	N/A	Feat	N/A	Feat	N/A	N/A
Integrated Modem (nonswitched)	N/A	Feat	N/A	Feat	N/A	N/A
Integrated Modem (switched with manual answer)	N/A	Feat	N/A	Feat	N/A	N/A
Internal Clock	N/A	Feat	N/A	Feat	N/A	N/A
Direct Attachment	Std	N/A	Std	N/A	Std	Std
Display Field Attributes	Std	Std	Std	Std	Std	N/A
Blink						
Column Separator						
High Intensity						
Nondisplay						
Reverse Image						
Underscore						
Dual Cluster	N/A	Feat	N/A	Feat	N/A	N/A
Expanded Function	N/A	Feat	N/A	Feat	N/A	N/A
Self-Check Number						
Copy-to-Printer						
Format Control	Std	Std	Std	Std	Std	N/A
Field edit and control						
Forms Stand	N/A	N/A	N/A	N/A	N/A	Feat
Help Function	Std	Std	Std	Std	Std	N/A
Keyboard Signal	Std	Std	Std	Std	Std	N/A
Keylock	Feat	Feat	Feat	Feat	Feat	N/A
Numeric 10-Key Cluster	Std	Std	Std	Std	Std	N/A
Uppercase/Lowercase	Std	Std	Std	Std	Std	Std
1,920-Character Single Display	N/A	N/A	Std	Std	N/A	N/A
960-Character Dual Display	N/A	N/A	N/A	N/A	Std	N/A
960-Character Single Display	Std	Std	N/A	N/A	N/A	N/A

Legend
  Feat — Special Feature
  N/A — Not Available
  Std — Standard Function

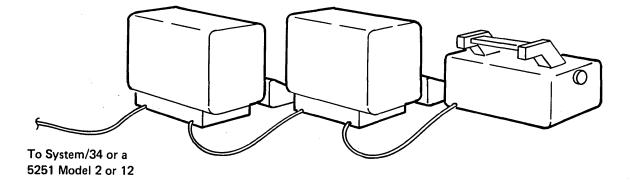## Audible Alarm

The Audible Alarm feature, available for the 5256 Printer, alerts the operator to problems that require attention. For example, the alarm sounds if the printer detects an error that would stop printing or if the 5256 Attention light comes on.

The Audible Alarm can be effectively used when operator intervention is required, for example, either during a wait or when the printer is unattended. There is a manual volume control for this alarm at the rear of the printer.

Cable Thru

The Cable Thru feature provides the capability of attaching multiple display stations or printers to a single cable. A maximum length of 1,525 meters (5,000 feet) of cable is allowed between System/34 or a 5251 Model 2 or 12 and the last work station on the cable. The Cable Thru feature is not required on the last work station on the cable thru line.

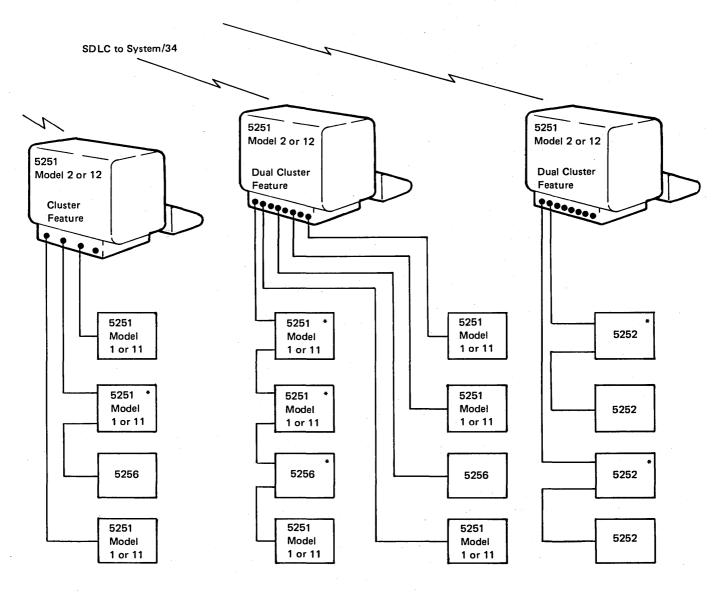To System/34 or a
5251 Model 2 or 12

Display stations and printers with the Cable Thru feature have an additional cable connector and station address switches. The address switches are used to assign a unique address to each station on a cable. Station addresses must be assigned prior to setting up the display system or when the System/34 is configured.

Cluster Features

Two mutually-exclusive cluster features (Cluster or Dual Cluster) are available for the direct attachment of 5256 Printers, 5251 Model 1 or 11 Display Stations, or 5252 Dual Display Stations, to the Model 2 or 12. The Cluster feature provides four cable connections and allows the attachment of up to four work stations. The Dual Cluster feature provides eight cable connections and allows the attachment of up to eight work stations. The 5252 counts as two work stations because of its two keyboards.

Figure 6 shows three 5251 Model 2 or 12 Display Stations in cluster
configurations: one display station has the Cluster feature and the other two
display stations have the Dual Cluster feature. Each 5251 Model 2 or 12 is
controlling the maximum number of directly attached work stations.

This illustration also shows two methods for connecting directly attached work
stations to the Model 2 or 12. The cables can be connected directly between
the Model 2 or 12 and the work station, or, the cables can be connected
between two work stations when they have the Cable Thru feature. Both
methods can be used in a cluster configuration. Whichever method you
choose, the furthest attached work station on each line can be no more than
1,525 meters (5,000 feet) away from the System/34 or 5251 Model 2 or 12.

*Cable Thru Feature

Figure 6. Cluster Configurations

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Communications Features

Internal Clock

The Internal Clock feature provides clocking of the data onto and off of the communications line at 1,200 bits per second. This feature is required only when the attached modem does not provide its own clocking.

DDS Adapter

The DDS Adapter feature allows the 5251 Model 2 or 12 to be connected to an AT & T nonswitched (leased) Data-Phone[1] Digital Service Network. The DDS Adapter provides an interface to a DDS channel service unit, which is the customer site termination to the network. The digital network provides the Model 2 or 12 user with data rates of 2,400, 4,800, or 9,600 bits per second on the communications line.

EIA Interface

This feature provides the 5251 Model 2 or 12 an interface for attaching an external modem meeting the EIA Standard RS-232C characteristics. The external modem can be either an IBM modem or a non-IBM modem. The modems must be compatible at each end of the communications line. The modem attachment is made via an IBM-supplied communications cable. Additional modem interface information is available from your IBM representative.

Integrated Modems

The 5251 Model 2 or 12 offers two 1,200 bps Integrated Modems:

- Nonswitched

- Switched with manual answer

These modems connect the Model 2 or 12 to either a customer owned communications line or to a common-carrier-provided switched or nonswitched communications line. When operating on a switched common carrier line, the 1,200 bps Integrated Modem is connected to a data access arrangement. Attachment to a nonswitched facility is via an IBM-supplied cable directly to the line. Integrated modems require the Internal Clock feature.

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[1]Trademark of American Telephone & Telegraph Co.
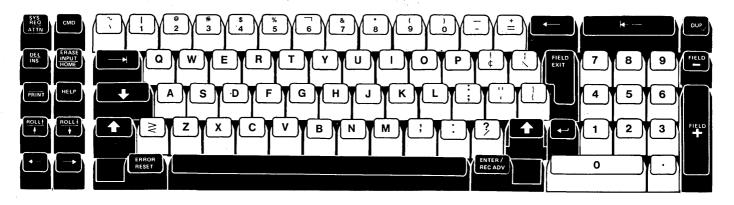
Expanded Function

The Expanded Function feature includes copy-to-printer and self-check number capabilities.

Copy-to-printer provides for the direct transfer and printing of a display image from a directly or remotely attached display station to a printer attached to the 5251 Model 2 or 12. The selection and allocation of the printer is controlled by the system program.

Self-check verifies a numeric field at the same time the field is entered. Self-check compares a precomputed digit to the last digit entered in the field. The self-check number detects incorrect entering of a single digit, single transpositions, and double transpositions. The 5251 uses either modulus 10 or 11, two standard algorithms, to verify the self-check digit.

Keyboard

The keyboard, shown in Figure 7, is the same for all models of the display stations and has the basic key arrangement found on a standard typewriter. A cable connects the keyboard to the display unit, allowing the keyboard to be placed in the most convenient work position.
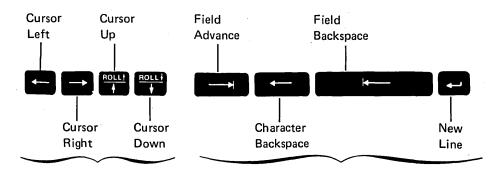

Figure 7. Keyboard

The keyboard has several types of keys to accomplish specific purposes:

- The standard alphameric keys (letters, numbers, and special symbols) to enter data

- Cursor movement keys to position the cursor

- Function control keys to communicate with System/34

- A command key that permits selection of 24 programmable, command functions, assigned to the top row of keys

- An extra set of numeric keys arranged like a calculator keyboard

The alphabetic keys, special symbol keys, numeric keys, spacebar, and cursor control keys repeat their function. The operator simply keeps the desired key pressed and the display station performs the action once, pauses, then automatically repeats the function at the rate of approximately 10 repetitions per second.

Cursor movement keys permit rapid positioning of the cursor to any character position on the display. These keys cause the cursor to move in the direction indicated by the arrows on the keytop.

Cursor Left   Cursor Up   Field Advance   Field Backspace

Cursor Right   Cursor Down   Character Backspace   New Line

These keys move the cursor to any location.

These keys move the cursor only to locations programmed to accept operator input.

The numeric 10-key cluster (shown below) is convenient to use when entering numeric data.
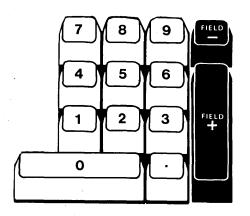
Figure 8 shows the function control keys. These keys perform system-related functions as well as operations on the display station.

	Function	Description
[↑] [SYS REQ ATTN]	System Request	Used with the Enter key to initiate the sign-on procedure.
[SYS REQ ATTN]	Attention	Used to signal the host system.
[CMD]	Command	Assigns the alternative functions for the top row of keys.
[↑] [DEL INS]	Delete	Causes the character above the cursor to be deleted and moves to the left, one position, all characters that are to the right of the cursor and in the same field.
[DEL INS]	Insert	Used to select Insert mode. Insert mode allows characters to be inserted into a field while the character above the cursor and all following characters in the field are shifted to the right.
[↑] [ERASE INPUT HOME]	Erase Input	Blanks all operator entered data and fields that the operator has modified.
[ERASE INPUT HOME]	Home	Returns the cursor to the home position (first input position of the first input field) or requests a record backspace if the cursor is at the home position.
[PRINT]	Print	Requests the information that appears on the display screen to be printed.
[HELP]	Help	Used to request additional information about an error or to request help from the system.
[↑] [ROLL↑] [ROLL↓]	Roll	Used to move the displayed information up or down to change the effective viewing area.

Figure 8. Function Control Keys

Keylock

The Keylock feature, which is available for all models of the display station, provides a lock and key that can be used to disable the display station whenever it is to be left unattended. When the key is in the locked position or is removed from the display station, the operator is unable to input or display data. When the key is in the unlocked position, data entry and display is allowed. The key cannot be removed when it is in the unlocked position.

The 5250 Information Display System offers a wide range of functional capabilities that enhance both system and operator control over data flow and application performance.

5251 AND 5252 DISPLAY STATIONS

This section describes the functional capabilities of the display station.

Command Functions

Twenty-four additional functions can be assigned to the top row of keys. This capability allows unique adaptability of the display station to your own applications. The additional functions can be written on a template and the template placed in the recessed area above the top row of keys. Extra templates are provided with each display station making it convenient to use a separate template for each application.

Display Mode	13	14	15	16	17	18	19	20	21	22	23	24	Clear
	1	2	3	4	5	6	7	8	9	10	11	12	Test Request

The *IBM 5251 Display Station Keyboard Template Assignment Sheet and Display Screen Layout Sheet*, GX21-9271, (see Figure 9) applies to both the 5251 and 5252 and can be used to document the additional functions.

The Cmd (command key) is used to select the command functions.

Pressing the Cmd key and then pressing one of the top row keys selects command functions 1 through 12, or Test Request. Pressing the Cmd key, then holding down the Shift key and pressing one of the top row of keys selects Display Mode, command functions 13 through 24, or Clear.

- *Clear* is used to blank every character position on the display screen and position the cursor to the first character position on line 1.

- *Test Request* is used to select an interactive procedure for checking communication between the display station and System/34.

- *Display Mode* allows the operator to select the display mode best suited for the light level. Light characters can be displayed on a dark background or dark characters can be displayed on a light background.

IBM ®

5251 Display Station
Keyboard Template Assignment Sheet and
Display Screen Layout Sheet

Format Name _____ Description _____

Job Name _____ Sheet _____ of _____

Originated by _____ Date _____

Display Mode	13	14	15	16	17	18	19	20	21	22	23	24	Clear
	1	2	3	4	5	6	7	8	9	10	11	12	Test Request

Keyboard Template Assignments

1	
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Display Screen Layout Sheet

COLUMN

Language Group

The 5251 and 5252 character sets consist of alphabetic characters in either uppercase or lowercase, numerics, and special symbols. Keyboards and displayable character sets are provided for the following countries: Austria/Germany, Belgium, Canada (French), Denmark, Finland, France, Italy, Japan (English), Japan (Katakana), Norway, Portugal, Spain, Spanish-speaking countries, Sweden, United Kingdom, and the United States. An international character set is also available.

Display Control and Highlighting

The 5251 and 5252, with System/34, provide data entry control by data field. Each data field is established by a field attribute preceding the first position of the field. The field attribute, which is written by the system program, uses a single nondisplayed character position and serves as a visual separation between successive fields. A field can be started at any character position of the display and is variable in length. The attributes are shown in Figure 10.

Figure 10. Highlighting Attributes

Blink: Causes all characters in the field to blink repeatedly. The entire field is blinked at the rate of approximately one and one-half times per second.

Column Separator: Causes all characters in the field to be preceded and followed by a vertical bar. Column separators at the same column position on successive rows will appear as a continuous, vertical line on the display.

High Intensity: Causes the characters in a field to be displayed at a brighter intensity than other data on the screen. The brightness of high intensity fields is adjustable with the Contrast control on the control panel.

Nondisplay: Allows data to be entered without it being displayed. This attribute is beneficial in applications where there are security restrictions. An identification can be entered in nondisplay fields to prevent unauthorized viewing.

Reverse Image: Causes the characters in the field to be displayed as either a dark graphic on a light background or, if Display Mode had been previously selected by the display operator, light characters on a dark background. The preceding display capabilities, plus blink cursor, can be used to alert the operator that an error occurred or that a specified action must be performed.

Underscore: Places a continuous line under all positions of the field.

Format Control

The following field edit and control functions are provided by System/34 or by the 5251 Model 2 or 12.

Alpha Only

Fields specified as alpha only allow only the characters A through Z, comma, period, hyphen, and blank to be entered.

Alphameric Entry

A field specified as alphameric allows the operator to enter all characters on the keyboard. Manual shift is required to enter uppercase and symbols on the upper part of the key.

Auto Enter

A field specified as auto enter causes the same function as if the operator pressed the Enter key at the conclusion of entering information for that field.

Bypass

A field specified as bypass restricts information from being entered. This field is skipped over whenever the cursor would appear within the field.

Duplicate Enable

A field specified as duplicate enable allows the Dup key to be pressed by the operator. Dup typically is interpreted by the application program to mean duplicate this field from the previous record.

Field Exit Required

A field specified as field exit required requires that a field exit key, cursor movement key, or any other nondata key, be used to exit the field. If the operator attempts to leave a field defined as field exit required by using a data key, an error will be displayed.

Mandatory Entry

A field specified as mandatory entry requires that at least one character must be entered in the field.

Mandatory Fill

A field specified as mandatory fill requires that if one character is entered in the field, the entire field must be filled.

Monocase

A field specified as monocase causes lowercase alphabetic characters A through Z to be automatically changed to uppercase A through Z when entered. This does not occur for any other characters or symbols. Unless otherwise specified on System/34, fields default to monocase rather than uppercase and lowercase.

Numeric Only

A field specified as numeric only accepts only the characters 0 through 9, plus, comma, period, hyphen, and blank.

Right Adjust

A right-adjust field allows data entered into the field to be moved to the right field boundary when the Field Exit, Field +, or Field - key is pressed. If the field is not filled, the positions to the left of those characters entered by the operator are filled with either zeros or blanks.

Signed Numeric

Signed numeric fields reserve the units position of that field for display of the sign; minus for negative, and blank for positive. For example, a six-position signed numeric field can use only five positions for operator entered data with the sixth position reserved for the sign. Pressing the Field Exit key results in the positive indication. In addition, a signed numeric field allows only 0 through 9 to be entered and the numbers are automatically right-adjusted with blank fill, or zero fill if requested.

Help Function

If an error code is not understood by the operator, the Help key can be used to request additional information about the error. The Help function can also be implemented in an application program to provide help that is not error condition related.

Keyboard Signal

A keyboard signal can be programmed to operate for approximately one second, thus producing an audible tone. The keyboard signal can be effectively used as a ready signal during a wait.

Communications

The 5251 Models 2 and 12 Display Stations include a communications adapter for communicating with System/34. The communications adapter performs the general functions common to SNA/SDLC (systems network architecture/synchronous data link control). SNA/SDLC is a line discipline, using centralized control, for synchronous transmission by buffered work stations on a data transmission link. SDLC includes error detection and recovery procedures that permit automatic error recovery for transmission errors occurring on the data link. Therefore, SDLC results in increased transmission efficiency and utilization of common carrier facilities.

After SDLC receives the data and acknowledges validity of the data, it routes the data to SNA for processing. SNA formally defines the functional responsibilities of communications system components. The 5251 Model 12, an SNA communications product, can perform functions that were formerly done by the host system. These functions can include device control and data formatting. By placing these functions in the Model 12, application programs and additional 5250 Information Display System products can be added or changed without affecting other elements of the communications system.

5256 PRINTER

This section describes the functional capabilities of the printer.

Language Group

The 5256 character set consists of alphabetic characters in either uppercase or lowercase, numerics, and special symbols. Character sets are provided for the following countries: Austria/Germany, Belgium, Canada (French), Denmark/Norway, Finland/Sweden, France, Italy, Japan (English), Japan (Katakana), Portugal, Spain, Spanish-speaking countries, United Kingdom, the United States, and Canada. An international character set is also available.

Bidirectional Printing

Bidirectional printing is the ability to print from left to right and right to left. Bidirectional printing and concurrent tabbing with high-speed line feeding makes the average printing rate dependent on the length of the printed line, the amount of tabbing within the printed line and the amount of line feeding between printed lines. Bidirectional printing and dual print buffers increase the throughput of the printer.

Dual Print Buffers

The 5256 Printer uses two 256-byte receive buffers and two 132-byte print buffers. When a block of data is received, the printer formats the data into print lines. Then as each print line is formatted, printing is started and formatting of the next print line is initiated. Two print buffers are used to ensure that the formatting is one line ahead of the printing.

This chapter describes the display system environment, discusses two general areas where display systems can be used, and then describes a sample application.

Display System Environment

Business firms of varying sizes and branch locations of larger companies are considering display systems because they:

- Increase productivity through system/operator interaction.

- Provide fast update and visual verification of system files.

- Extend system data files to using departments.

- Provide fast system console response.

Two or more display stations can be used at the same time. For example, a purchasing agent can use a display station for inventory control while a clerk is using another display station to fill customer orders. Figure 11 shows a typical display system environment.

Figure 11. Display System Environment

The display station operator can treat the displayed information as if it were in a book; like turning the pages, looking at one page at a time, making additions and corrections to the data in the format displayed on the screen, checking each page for accuracy, and extracting the needed information.

Operators will find the display station easy to use. The keyboard has a layout similar to a typewriter. Information can be entered in free or formatted form. The sequence of items entered is important in free form but the location of the items on the display screen is not. In formatted form, the operator usually enters information opposite a prompting message.

A display station has capabilities that make selected data fields easily identified. High intensity, reverse image, blink, underscore, and the column separator are useful capabilities in an application where exceptions must be apparent. These capabilities are also useful for inquiry and data entry applications.

Inquiry

A display station used for inquiry allows the operator to have access to a computer data file. The operator typically asks one or more short questions (inquiries) by entering in a specified code. The system responds by displaying information. The response might be lengthy and require the operator to read and interpret the information returned. Based on the first system response, the operator might enter another question. While the operator is reading the returned information, the system addresses other display stations or does other work until the operator again requests more information.

Upon completion of an assignment, an operator can sign off and return to other work. Meanwhile, someone else can use the display station. In this way, the display station can be shared by people with different work requirements.

The number of display stations to be shared depends on the number and frequency of questions, the duration of an inquiry session, and the locations of departments or persons needing access to System/34.

Inquiry with Update

The ability to find and change a record, called inquiry with update, is a natural follow-on to inquiry. Changes sometimes must be made to records being referred to by inquiry. For example, a hospital patient's medication orders may have to be changed quickly according to changes in the patient's condition, or a hotel guest's bill may have to be updated just before checkout.

Data Entry

There are two common types of data entry applications; both involve continuous operation of the display station. In the first type, the operator can be preparing a document such as a sales order. The system guides the preparation of the order and supplies some of the data to be printed. The operator enters the customer number, item numbers, and quantities. The system can be programmed to supply the customer name and address, unit prices, description, and price extensions for the items ordered.

The second type of data entry application provides for data recording in much the same way as an offline key entry device is used to punch cards or write diskettes. With a display station, the information is entered directly into System/34 as data files.

Sample Application

An order from a customer initiates many activities in the business cycle. An order enters the data processing cycle in written form, on what is called a source document. How this source document is written and who writes it will vary from company to company. In many cases, an order form is filled out by the salesman and delivered directly. In other businesses, salesmen or customers might phone in orders, which are written down by an order clerk as they come in.
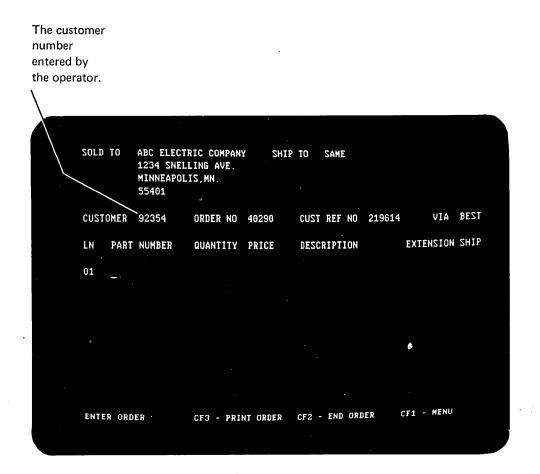
The 5250 Information Display System offers a display station and printer for performing the functions related to entering information into the system and printing reports. For example, the display station is used for creating the customer order file and the printer is used for printing invoices and picking slips. The following description of the order entry application is simplified to show the role of the display station.

The operator begins the daily activity by entering the sign-on command, with or without a password. If a password is requested by the program, the display station's nondisplay capability can be used to retain confidentiality of the code. The Keylock feature can also be used to prevent unauthorized use of the display station.

Next, the system displays an application menu, which is a list of jobs that can be performed. A menu simplifies the operator's duties by displaying a code corresponding to the job; this eliminates the need for the operator to know procedures and commands. The operator simply enters a code corresponding to the job and enters a password if one is required. From the following display, assume the operator selected the code for the order entry application.

```
 COMMAND                                                    D1
                              . MENU: MENU1
      1. STOCK STATUS INQUIRY            13.
      2. ORDER ENTRY  ·                  14.
      3. INQUIRY OF ORDER STATUS         15.
      4. WORK ORDER RELEASE              16.
      5. WORK ORDER INQUIRY              17.
      6. PRODUCT STRUCTURE INQUIRY       18.
      7. WHERE USED INQUIRY              19.
      8. ROUTING INQUIRY                 20.
      9. WORK IN PROCESS UPDATE          ·21.
     10.                                 22.
     11.                                 23.
     12.                                 24.



      ENTER NUMBER, COMMAND, OR OCL.

                                        <- READY
      _
```

The order entry process is an interactive procedure, with the operator entering information and the system responding with information from the customer master file and the item master file. To begin the order entry process, the operator enters the customer number. The system then compares this number to the customer master file and responds by displaying an order format with the SOLD TO name and address and the customer number, or an error message when an invalid customer number is entered.

The customer
number
entered by
the operator.

```
     SOLD TO    ABC ELECTRIC COMPANY      SHIP TO    SAME
                1234 SNELLING AVE.
                MINNEAPOLIS,MN.
                55401

     CUSTOMER  92354    ORDER NO  40290    CUST REF NO  219614     VIA  BEST

     LN   PART NUMBER    QUANTITY  PRICE    DESCRIPTION          EXTENSION SHIP

     01    _



     ENTER ORDER           CF3 - PRINT ORDER   CF2 - END ORDER    CF1 - MENU
```

After confirming the customer name and address and entering other heading information (if required), the operator is ready to begin entering line item information. The operator would normally enter the part number and quantity and then press the Enter key. Mandatory entry could be specified for the part number field whereas the quantity field, if not entered, would default to 1. After the system validates these entries, the price and description will be displayed, the system calculates and displays the price extension, and the operator can visually verify the line. The high intensity or blink field attributes could be used to get the operator's attention if an incorrect part number was entered.

The part number and
quantity entered by
the operator.

```
  SOLD TO    ABC ELECTRIC COMPANY      SHIP TO    SAME
             1234 SNELLING AVE.
             MINNEAPOLIS,MN.
             55401

  CUSTOMER  92354    ORDER NO  40290      CUST REF NO  219614      VIA  BEST

  LN    PART NUMBER    QUANTITY  PRICE    DESCRIPTION        EXTENSION SHIP

  01        2890          2       1.46    INSULATOR             2.92    2
  02         214          1      12.30    RELAY                12.30    1
  03        1478          6       6.06    BATTERY              36.36    6


                                                        TAX       2.06
                                                        FREIGHT   5.16

                                                        TOTAL    58.80

     ENTER ORDER           CF3 - PRINT ORDER   CF2 - END ORDER    CF1 - MENU
```

Three options are available to the operator while entering the order. For example, the command function keys can be programmed to print the order (CF3), end the order (CF2), or return to the application menu (CF1). These functions are displayed at the bottom of the display.

After the entire order has been entered, the system calculates the taxes and shipping charges, and then compares the total amount of the order with the customer's credit limit in the customer master file. The total amount is displayed or a message is displayed indicating the order exceeded the credit limit. The message could be displayed in reverse image or blinked to emphasize the error condition.

After all orders are entered, the operator uses CF1 to return to the application menu and selects another job. The system retains the order information for updating the item master file and for printing invoices and management reports.

Planning the Installation

You should read the *IBM 5250 Information Display System Installation Manual—Physical Planning*, GA21-9277, to determine how to best prepare your site for arrival of the equipment.

Some of the topics discussed in the manual are:

- Space requirements

- Environment

- Furniture

- Electrical requirements

- Cable specifications

- Unit specifications

Careful advance planning and scheduling makes it possible for you to set up the equipment with little interruption of the daily work routine.

Setting Up the System

After planning and preparing the location, you will be ready to set up the display system.

When the equipment arrives, plan to have two people available to lift the machines from the cartons and set them in place. Then set up the equipment by following the step-by-step instructions provided with each machine.

No tools or access to the inner parts of the machine will be required. The complete process consists of unpacking the machines, locating the machines in the prepared areas, connecting the cables, and performing a checkout procedure to verify that they operate properly.

The instructions should be used if the machines are subsequently moved to other areas.

Reliability and Serviceability

The 5251, 5252, and 5256 incorporate some of the latest technological advances in the industry and use high-quality components to increase reliability of the machines. Should a problem occur, IBM has included procedures that allow the operator to either correct the problem or to accurately describe the problem to the service representative.

Error Codes

Error codes tell the operator that an incorrect operation was attempted or that System/34 is not responding properly. Some error codes can be displayed with a message that explains the situation and how to correct the situation.

Basic Testing Routines

Basic testing routines can be used by the operator to periodically check out all operations of the machines. On the display station, the operator selects Test Request; on the printer, the operator moves the Status switch to Test. The operator's guides will tell the operator what to expect from the basic testing routines and what to do if the routines should detect a problem.

Problem Determination

When a problem is suspected, the operator should determine the operational status of the machine before calling the service representative. This can be done using the problem determination procedures in the operator's guides. These procedures are designed for use by an operator who has little or no data processing experience. They will guide the operator step-by-step in determining whether the problem was caused by an incorrect operating procedure, a common carrier transmission problem, or a machine failure. For example, the procedures suggest that the operator verify the operating procedure used when the problem occurred. If the problem is within the display station or printer, the procedures assist the operator in gathering pertinent information and inform the operator what to report when calling the service representative. The operator's description of the problem will speed the repair action by the service representative.

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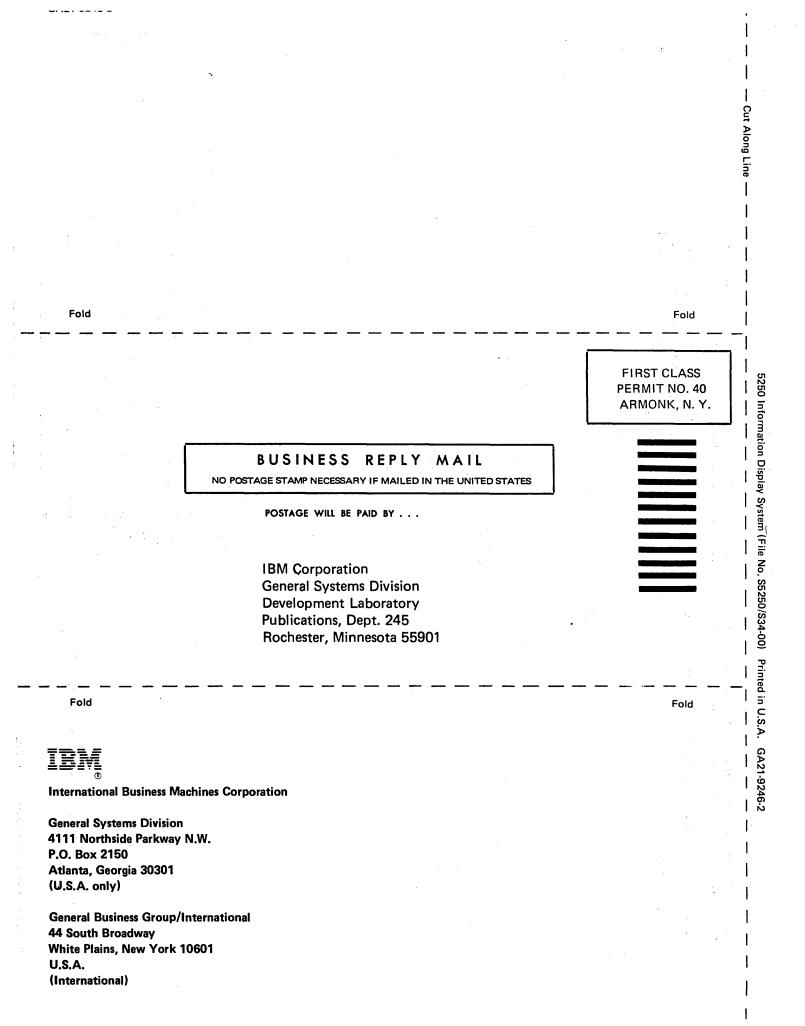
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