

Chapter 2

IBM 3270 Information Display System

IBM 3270 Information Display System(frontispiece) is a family of products that can be tailored to meet the needs of alphanumeric display applications. The IBM 3270 system offers the user a wide selection of components and configurations. Components of the IBM 3270 can be selected to form IBM 3270 system configurations attachable to System/360, System/370, System/3, 4300 Processor, 8100 Information System, and 3709 Communication System configurations as host systems. The IBM 3270 system can be attached locally or remotely to a host system. IBM 3270 systems employ binary synchronous communication(BSC) or synchronous data link control(SDLC) protocol. Figure 2.1 illustrates the overview of IBM 3270 system. (2)

The IBM 3270 Information Display System has three basic components: a control unit, a display station, and a printer. The control unit provides for the IBM 3270 system's attachment to a data processing system and directs the operation of attached display stations and printers. The display station provides image of data transmitted from the host system. A display station with an attached keyboard enables the user to enter, modify,

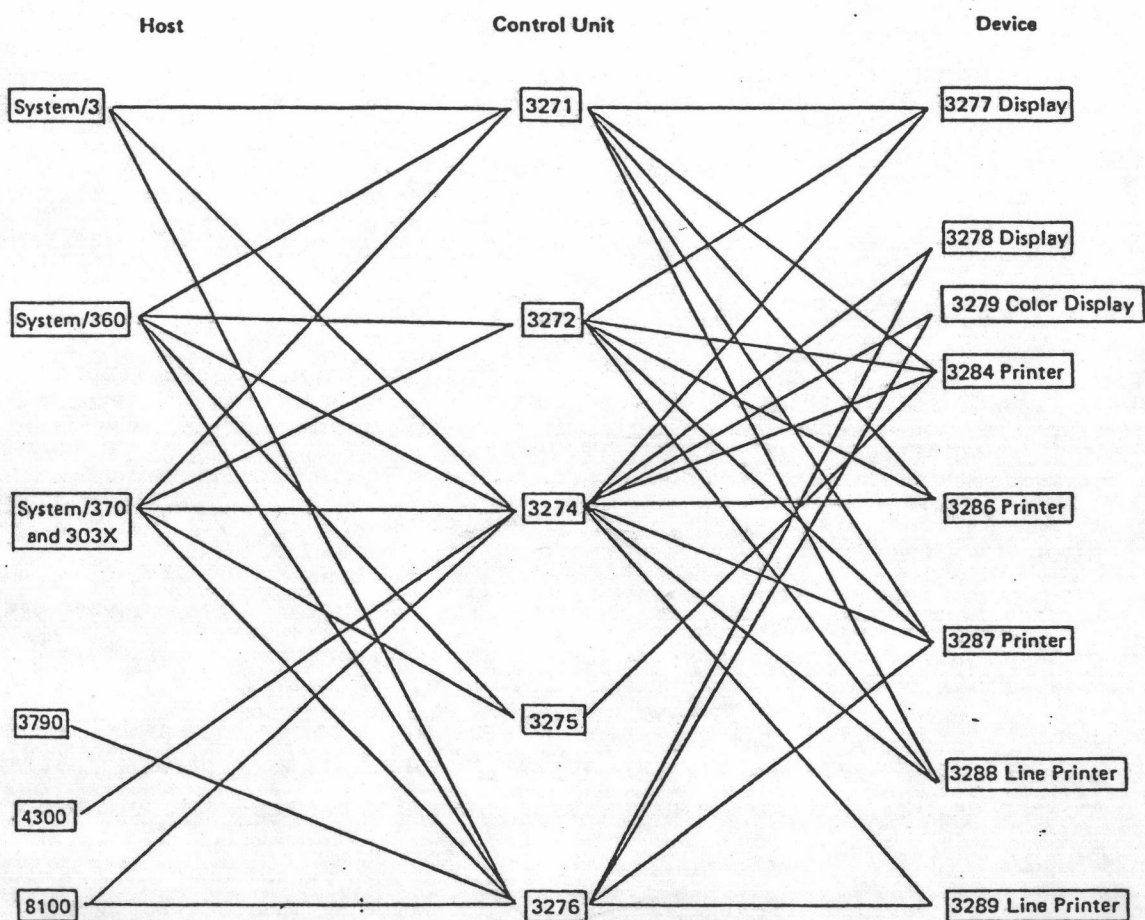


Figure 2.1 Host Control Unit and Device Combination. (2)

or delete data on the display, and to cause the revised data to be returned to the host system for storage or additional processing. The printer provides printed copy of data displayed at a display station or transmitted from the host system. (1)

IBM 3278 is a Display Terminal which can be attached locally to the Host System through IBM 3274 control unit model 1B or 1D. It can also be attached remotely to the Host System through IBM 3276 control unit/display station or IBM 3274 control unit model 1C. (2)

2.1 Control Units

Each unit in the IBM 3270 system has its own buffer for storing data (Figure 2.2). When not executing a command operation, the control units continually perform an internal poll of all attached devices. Internal polling is performed to determine the current device status and whether the device has an I/O pending condition. The current status of each device indicates to the control unit whether the device is available, ready, or busy. This information is recorded in the associated device adapter in the control unit. When the program addresses a specific device, the control unit stops the sequential polling and polls the addressed device to obtain its latest status. If conditions permit, the control unit communicates solely with the device until

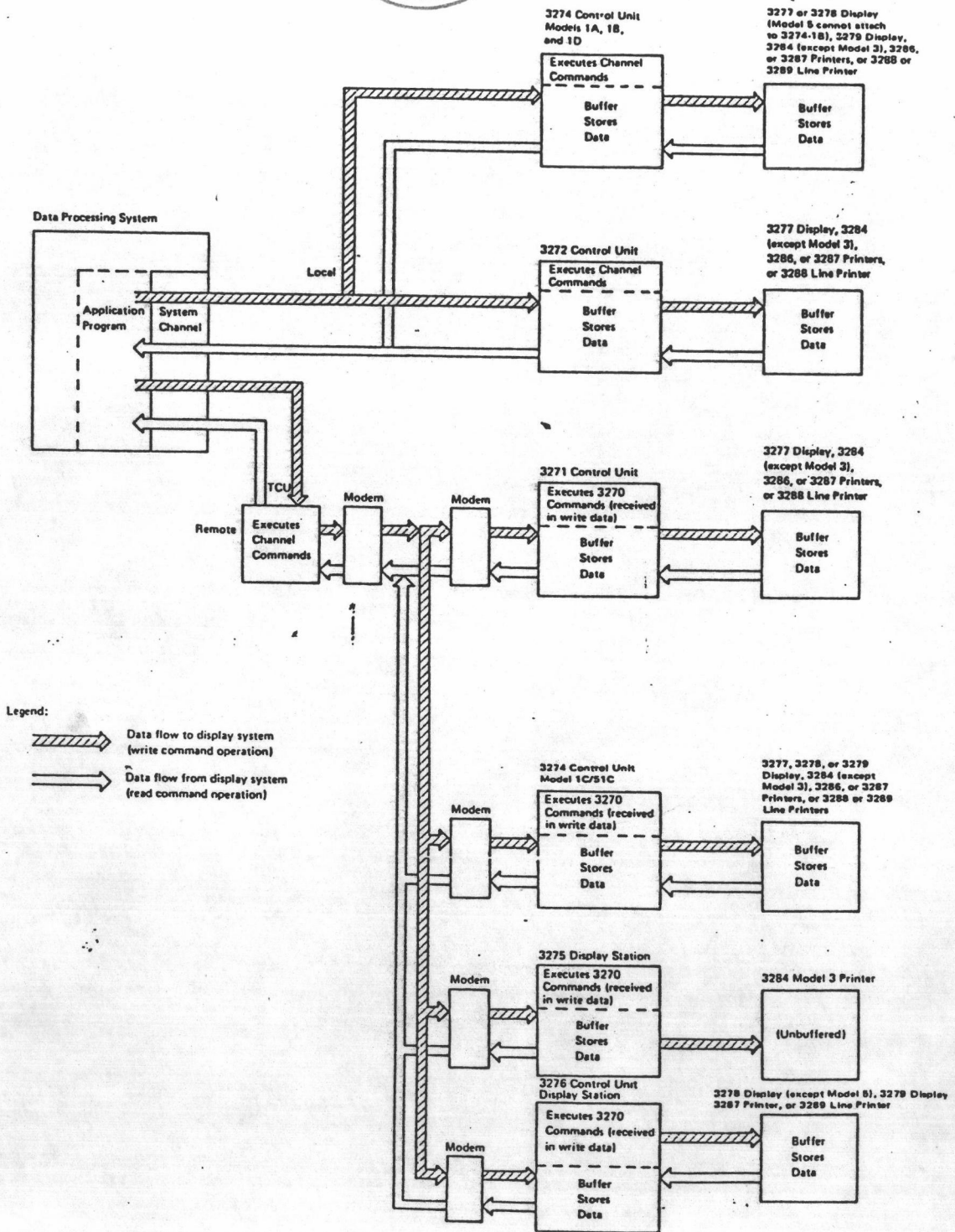


Figure 2.2 Data Flow between Data Processing System and IBM 3270 Information Display System. (2)

the operation is completed. At that time, sequential pooling is resumed. (2)

2.2 Data Stream

The IBM 3270 data stream consists of user-provided data, commands, and orders which are transmitted between the control unit and the host system (Figure 2.2). Control information, which governs the movement of the data stream, is also transmitted. The control units can differ as to the type of commands and/or transmission employed. (2)

Commands are issued to initiate such operations as the total or partial writing, reading, and erasing of data in a selected IBM 3270 device buffer. Orders can be included in writing data streams, either alone or intermixed with display or print data. (2)

2.3 Binary Synchronous Communications(BSC)

BSC procedure provides a set of rules for synchronous transmission of binary-coded data. BSC expands the transmission capabilities of present and future teleprocessing facilities through its ability to accommodate a variety of transmission codes. Also available is a transparency feature that allows transmission of control characters and various forms of raw data within the normal message format without any associated control or graphic significance. BSC is

capable of accomodating a broad range of medium and high speed equipment. (3)

All data in BSC is transmitted as a serial data stream of binary digits. Synchronous communications means that the active receiving station on a communication channel operates in step with the transmitting station through the recognition of a specific bit pattern(sync pattern) at the beginning of each transmission. (3)

2.4 IBM 3278 Display Station

The main functions of IBM 3278 Display Station are to display data transferred from the processor and to transfer data entered from the attached keyboard element to the processor. The displayed data can be changed or removed by the operator using the keyboard element and then returned to the processor for storage or additional processing. (5)

The IBM 3278 can be used in the IBM 3270 system and IBM 4300 Processor Complex. When used in the IBM 3270 system, it is attached to the IBM 3274 Control Unit or to the IBM 3276 Control Unit Display Station. When used in the IBM 4300 Processor Complex, it is attached through a Display/Printer Adapter (DPA) to the IBM 4321/4331 Processor. Figure 2.3 illustrates examples of the IBM 3278 in a system configuration. (5)

The IBM 3278 is a buffered display. Data

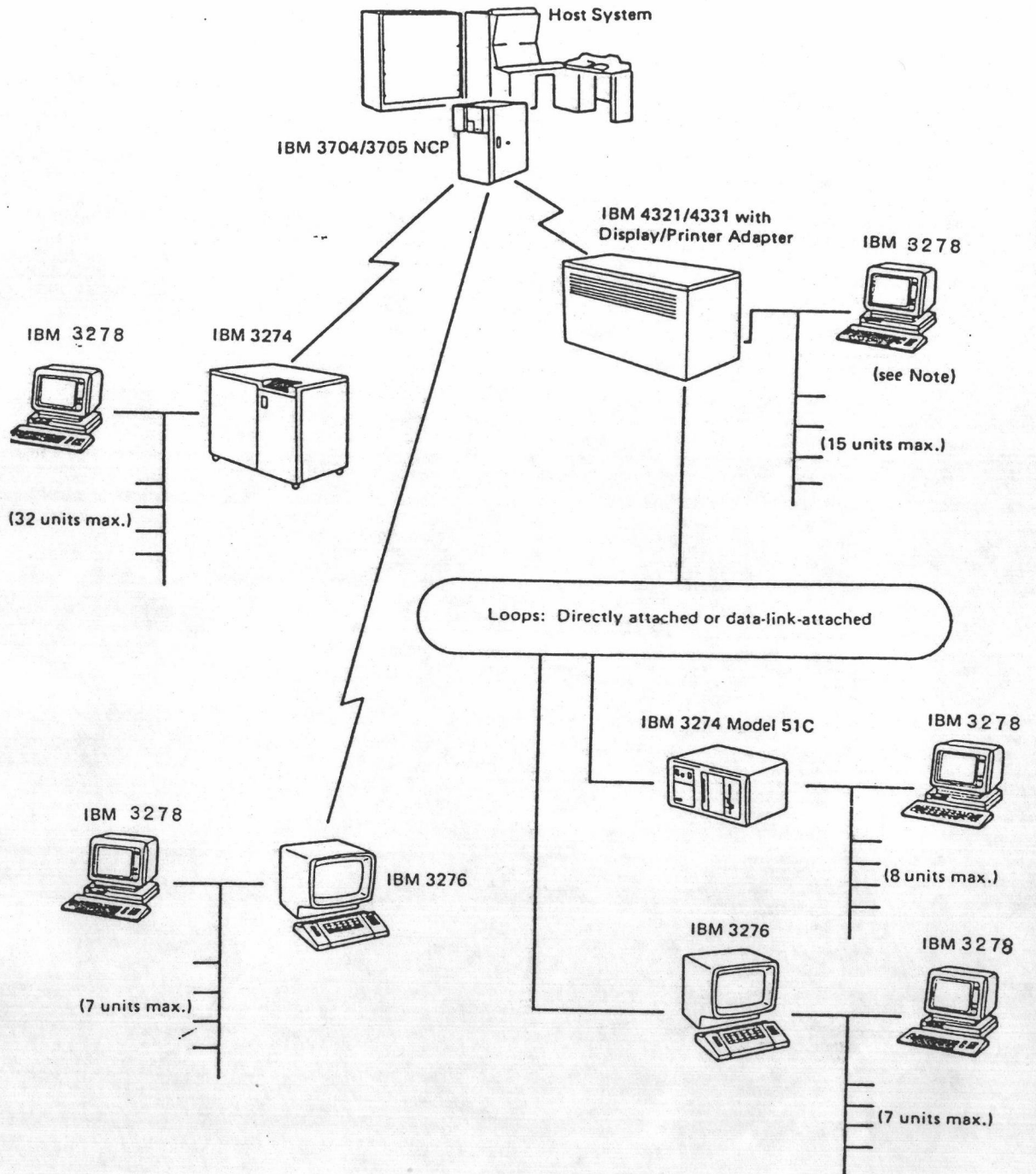


Figure 2.3 Examples of the IBM 3278 Display Station in a System Configuration. (5)

displayed on the display surface is stored in coded form in a display buffer; the buffer contains as many locations as there are character positions on the display surface. The data may be loaded from the processor by the application program or from the attached IBM 3278 keyboard element. Up to 1920 characters (24 rows of 80 characters each) of user data can be displayed. In addition, the operator information area, line 25, which is separated by a horizontal line, displays various messages (indicators) for the operator. Figure 2.4 illustrates the concept of the buffered display. (5)

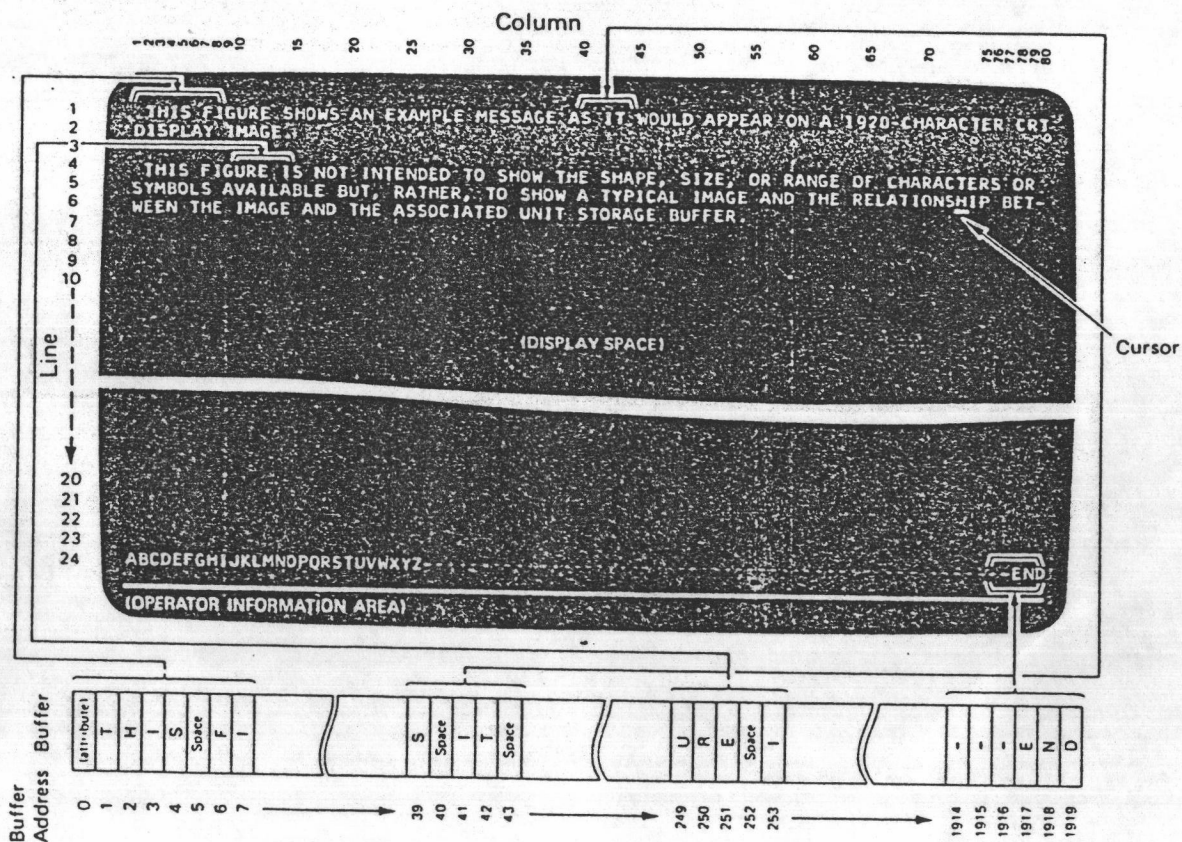


Figure 2.4 Relationship of Buffer Location and Display Surface Character Position. (5)



Display images can be formatted or unformatted. A formatted display is one that has separate fields defined by the application program. The first character position in each field has an attribute character that defines the characteristics of the field. An unformatted display is one that has no defined field. An operator can enter data into any position of the display surface. (5)

The application programs can organize the display space into display fields. Each field has a field attribute character that defines the start of the field; the character occupies a character location in the buffer. A field wraps from the last character location on one line to the first character location on the next line or may wrap from the last character location of the last line (column 80 of line 24) to the first character location of the first line. (5)

The field-attribute character occupies the first character location of each display field in a formatted display; the corresponding character location on the display surface is always blank, characteristics set by the field-attribute character are: (5)

1. Protected or unprotected. A protected field is one in which the operator cannot enter, delete, or change data; an unprotected field is available for the operator to enter, delete, or change data; the unprotected definition classified a field as an input

field. (5)

2. Alphameric or numeric. Subject to its being unprotected, an alphameric field is one into which an operator enters data normally, using the shift keys as required. When cursor enters a field defined as numeric, the keyboard is automatically placed into the shift required to enter numeric characters ("NUM" appears in the operator information area). The operator can then enter only numeric (0 through 9), the decimal symbol (.), the minus sign (-), and the duplicate character; any other character locks the keyboard. (5)

3. Normal Display, Nondisplay, or Intensified Display. Characters entered from the keyboard into a field are defined as normal display, nondisplay, or intensified. They are placed in the buffer for possible transmission to the processor later. The way these characters are displayed can differ; characters in a field defined as normal display appear normally on the display surface; characters in a field defined as nondisplayed are not displayed; and characters in a field defined as intensified display appear brighter than normal characters. (5)

4. Detectable or Nondetectable. A field defined as detectable can be detected for an application, such as menu selection, by pressing the Cursr Sel (Cursor Select) key while the cursor is within the field. The data in the

field detected will be transferred to the processor for further processing. A field defined as nondetectable cannot be detected by pressing the Cursr Sel key. (5)

When a character is entered into the last character location of an unprotected data field, the cursor is repositioned according to the attribute character describing the next field. (5)

If the field attribute character defines the next field as alphameric and either unprotected or protected, or as numeric and unprotected, the cursor skips the attribute character and is positioned in the first character location of that field. (5)

If the field attribute character defines the field as numeric and protected, the cursor automatically skips that field and is positioned in the first character location of the next unprotected field. (5)

2.5 IRMA Card Overview

IRMA is a printed circuit board which plugs into the IBM PC system unit. The board can be installed in any slot in the IBM PC and provides a back panel BNC connector for attachment by coaxial cable to either a IBM 3274, IBM 3276, or integral controller. (6)

IRMA operates in a stand-alone mode, using an on-board microprocessor to handle the IBM 3270 protocol and screen buffer. Whenever power is applied to IRMA, it

responds to commands from the controller as if an IBM 3278 is attached to the coaxial cable. The IRMA screen buffer is accessed from the IBM PC system unit as an I/O device. IRMA does not occupy any of the memory address space. (6)

To meet the requirement of the IBM 3270 protocol, IRMA uses high-speed microprocessor technology that is independent of the IBM PC's CPU. This allows the user to ignore the timing requirements of IBM 3270, and operate with a buffer of data just as the IBM 3278 screen does. (6)

While operating, the IRMA takes commands from a four-byte dual-ported register array in addresses 220H to 223H. This array is accessed by I/O from the system unit. The four single byte words are arranged as command with up to three arguments. Command words allow the system unit program to read or write bytes in the screen buffer, send keystrokes, and access the special features available on the IRMA. This array is also handled on the IRMA by the microprocessor which manages the IBM 3270 protocol. While IRMA is idle between messages from the controller, any commands left in the array by system unit programs are processed as required. This processing occurs only when the higher priority IBM 3270 communication is idle. This idle state is indicated by a busy/done flag mechanism for both the IRMA and system unit microprocessors. This allows the system unit to

declare that a new command is available to the IRMA and for the IRMA to signal the completion of this command. Figure 2.5 illustrates the system's block diagram of IRMA. (6)

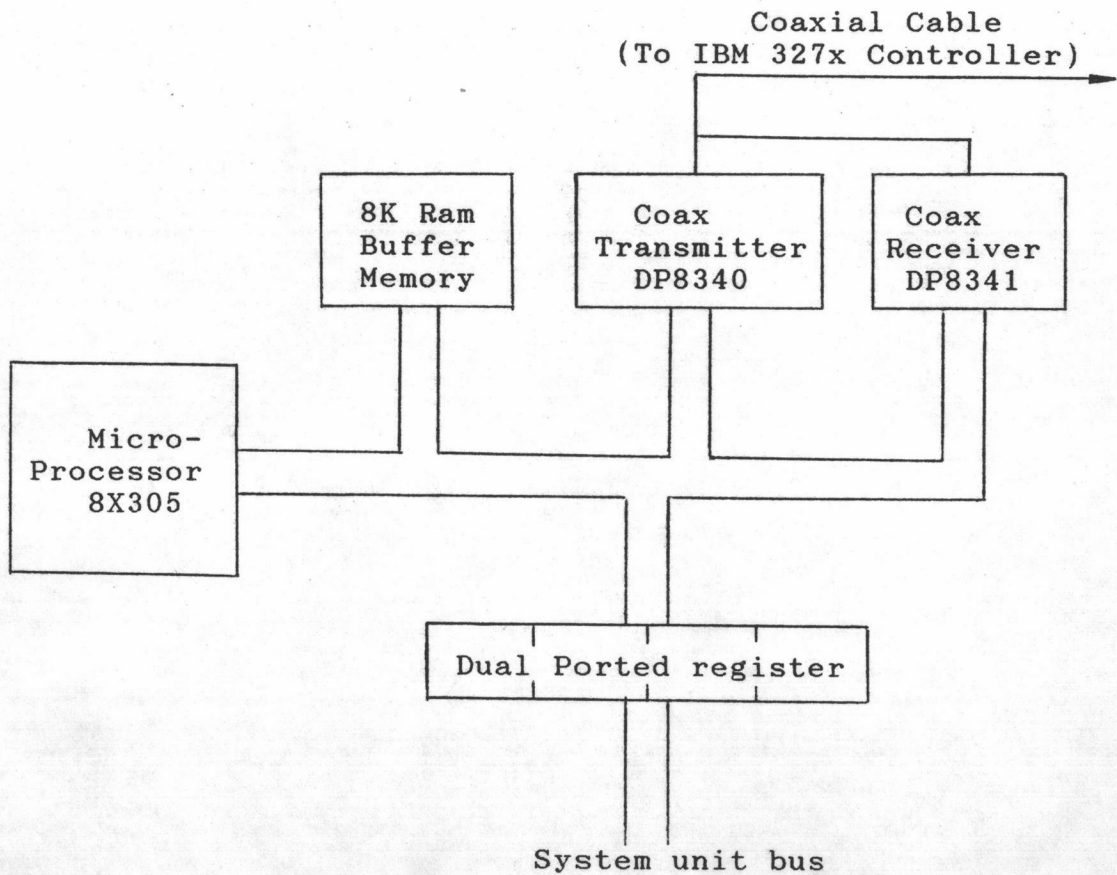


Figure 2.5 IRMA system's block diagram. (6)