IBM

4361

IBM 4361 Processor
Display/Printer Adapter
Component Description
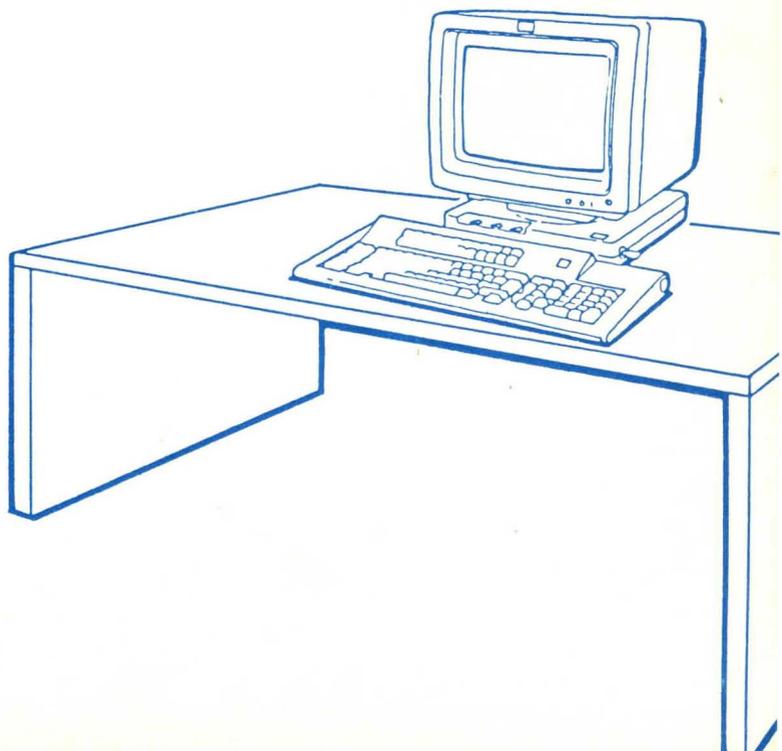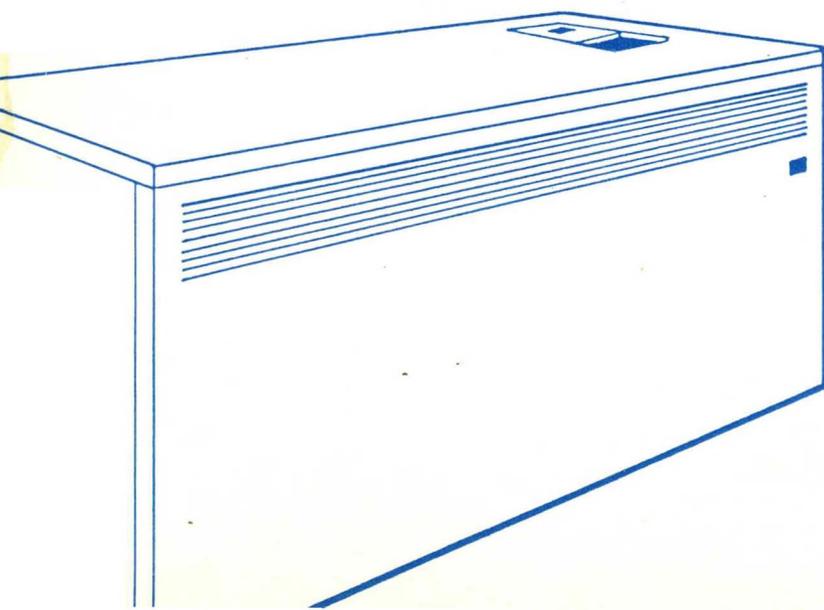
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Display/Printer Adapter
Component Description**

Federal Communications Commission (FCC) Statement

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

Preface

This publication provides management, programmers, and system analysts with detailed reference material relating to the IBM 3270 devices attached to the 4361 processor via the Display/Printer Adapter (DPA). It does not explain the function of the operators console. See *IBM 4361 Processor Operating Procedures,* GA33-1570.

For attachable devices refer to IBM 4361 Processors Summary, GA33-1572.

Organization of this Publication

This manual contains the following chapters:

Chapter 1. "Introduction" - Describes the 3270, its configurations, devices, and terminals. This chapter is a general guide to the overall 3270 devices attached to the Display/Printer Adapter.:

Chapter 2. "Display/Printer Adapter" - Describes generally the Display/Printer Adapter; it describes in detail the data streams, codes, commands, and orders used by these units. The chapter also describes unit and model-dependent differences.:

Chapter 3. "Displays" - Provides general information about displays. It presents detailed information about display fields, keyboards, and the security keylock.

Chapter 4. "Printer" - Discusses printer capabilities and control including formatting orders, and buffered functions.

Chapter 5. "Local Operations" - Describes how the Display/Printer Adapter attaches locally to the 4361 Processor, and presents programming information for the adapter.: Additionally, five appendices provide reference material, as follows:

    Appendix A. "Indicators and Controls"
    Appendix B. "Buffer Address I/0 Interface Codes"
    Appendix C. "Status Indicator Codes"
    Appendix D. "Katakana Feature"
    Appendix E. "Color Information"

A Glossary and an Index complete this publication.

Related Publications

The following publications provide additional background information and detail:

IBM System/360 Principles of Operation, GA22-6821

IBM System/370 Principles of Operation, GA22-7000

IBM System/370 and 4300 Processors Bibliography, GC20-0001

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

IBM 3270 Information Display System Configurator, GA27-2849

IBM 3270 Information Display System Character Set Reference Manual, GA27-2837

IBM 4361 Processors Summary, GA33-1572

Contents

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Chapter 1. Introduction

The IBM 3270 Information Display System is a family of products that can be tailored to meet the needs of alphanumeric display applications. The 3270 system offers the user a wide selection of components and configurations. Also available are a large variety of standard and special features which improve performance, provide additional operational capability, and permit expansion of the display system.

Display System Components

The 3270 devices have two basic components: display station and printer.

Display Station

A Display Station provides image display of data transmitted from the data processing unit. A display station with an attached keyboard enables the user to enter, modify or delete data on the display, and to cause the revised display to be returned to the processing unit for storage or additional processing.

Printer

A terminal printer provides printed copy of data displayed at a display station or data transmitted from the data processing system.

Display System Configuration

The Display/Printer Adapter of the IBM 4361 Processor controls up to 16 terminals. Port 0 is occupied by the operator's console. The remaining devices may be installed in any combination, provided that:

- Only seven (or 15 with optional feature) devices and
- No more than two system printers (3262 and/or 3289-4) are installed.

Display Unit (Special Features)

Security Keylock: This feature provides keylock control over display station and all attached keyboards. With the lock in the OFF position, the terminal will not be available to the host system program, the display screen data is blanked (except for the Operator Information Area and cursor), and attached devices are inoperative.

Audible Alarm: The Audible Alarm feature can be installed on any display station. An audible tone sounds whenever called for under program control.

Switch Control Unit: This feature permits switching operational control of the display between two different control units.

Keyboard Types

For keyboard types refer to, *IBM 4300 Processors Summary and Input/Output & Data Communications Configurator*, GA33-1523.

Chapter 2. Display/Printer Adapter

Each unit in the 3270 system, as used with the IBM 4361 Processor, has its own buffer for storing data. Buffers are checked to determine that all characters in the buffers have correct parity. A parity check error occurs when circuitry detects one or more characters with bad parity.

When not executing a command operation, the Display/Printer (D/P) Adapter continually performs 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 Display/Printer Adapter whether or not the device is available, ready, or busy. This information is recorded in the associated device adapter in the Display/Printer Adapter.

When an I/O pending condition is detected at an attached device, polling stops and the Display/Printer Adapter communicates solely with that device. When communication is ended, the Display/Printer Adapter commences polling at the next sequential device.

Additionally, when the program addresses a specific device, the Display/Printer Adapter stops the sequential polling and polls the addressed device to obtain its latest status. If conditions permit, the Display/Printer Adapter communicates solely with that device until the operation is completed. At that time, sequential polling is resumed.

Data Stream

The data stream consists of user-provided data, commands, and orders which are transmitted between the Display/Printer Adapter and the host system. Control information, which governs the movement of the data stream, is also transmitted.

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

Two types of orders are available. One type is executed as it is received by the Display/Printer Adapter. This type is used to position, define, and format data being written into the buffer; to erase selected unprotected data in the buffer; and to reposition the cursor. The second type of order specifies printer format. These orders are initially stored in the buffer as data and are executed only during a print operation.

The data stream, as transmitted and received by the 3272-1 and -2 (local attachment), is also accepted by the Display/Printer Adapter. The Display/Printer Adapter provides the same responses and functions basically with the same commands as the 3272.

Interface Codes

Data, commands, and orders transmitted between the Display/Printer Adapter and the host system are in the form of interface codes. Two different codes are

used in the United States: Extended Binary-Coded-Decimal Interchange Code (EBCDIC) and American Standard Code for Information Interchange (ASCII). The EBCDIC codes are also used in the World Trade Countries. (ASCII is available only in the United States.) Refer to *IBM 3270 Information Display System Character Set Reference,* GA27-2837, for details. ASCII code is not supported by the Display/Printer Adapter.

Figure 2-1 on page 2-3 shows the United States EBCDIC interface codes. Figure 2-2 on page 2-4 shows the control character codes. Refer to Appendix D for the Katakana codes.

Commands

Four basic types of commands used by the Display/Printer Adapter are executed by the IBM 3270 devices attached to the 4361 Processor:

1. Write commands, which are used to transfer data and orders from main storage to the Display/Printer Adapter.

2. Read commands, which transfer buffer data and keyboard key data to main storage.

3. Control commands, which cause certain printer or display station operations.

4. Sense command, which transfers to main storage a byte of sense data that reflects certain control or check conditions existing in the device or Display/Printer Adapter to which the command was addressed.

The command and associated code that can be executed follow:

Command	Display/Printer Adapter EBCDIC Hex
Erase All Unprotected	0F
Erase/Write	05
Erase/Write Alternate*	0D
Read Buffer	02
Read Modified	06
Write	01
No Operation	03
Sense	04
Sense I/O	E4

* Executed like Erase/Write command.

Bits 4567 / Hex	00	00	00	00	01	01	01	01	10	10	10	10	11	11	11	11	← Bits 0,1
	00	01	10	11	00	01	10	11	00	01	10	11	00	01	10	11	← 2,3
	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	← Hex 0
0000 0	NUL				SP	&	−									0	
0001 1		SBA					/		a	j			A	J		1	
0010 2		EUA							b	k	s		B	K	S	2	
0011 3		IC							c	l	t		C	L	T	3	
0100 4									d	m	u		D	M	U	4	
0101 5	PT	NL							e	n	v		E	N	V	5	
0110 6									f	o	w		F	O	W	6	
0111 7									g	p	x		G	P	X	7	
1000 8									h	q	y		H	Q	Y	8	
1001 9		EM							i	r	z		I	R	Z	9	
1010 A					¢	!	|	:									
1011 B					.	$	,	#									
1100 C	FF	DUP		RA	<	*	%	@									
1101 D	CR*	SF			(	)	_	'									
1110 E		FM			+	;	>	=									
1111 F					|	¬	?	"									

Note: Character code assignments other than those shown within all outlined areas of this chart are undefined. If an undefined character code is programmed, the character that will be displayed or printed is a hyphen (-); hex code 60 will be returned on a subsequent read operation. IBM reserves the right to change at any time the character displayed or printed and the I/O interface code returned for an undefined character code.

* CR = Carrier Return

Figure 2-1. United States EBCDIC I/O Interface Code for Display/Printer Adapter (3274-1B Compatible) and Attached Terminals

Bits 2-7	Graphic	EBCDIC	Bits 2-7	Graphic	EBCDIC
00 0000	SP	40	10 0000		60
00 0001	A	C1	10 0001		61
00 0010	B	C2	10 0010	S	E2
00 0011	C	C3	10 0011	T	E3
00 0100	D	C4	10 0100	U	E4
00 0101	E	C5	10 0101	V	E5
00 0110	F	C6	10 0110	W	E6
00 0111	G	C7	10 0111	X	E7
00 1000	H	C8	10 1000	Y	E8
00 1001	I	C9	10 1001	Z	E9
00 1010	¢,[	4A	10 1010	¦(EBCDIC)	6A
00 1011	.	4B	10 1011	,	6B
00 1100	<	4C	10 1100	%	6C
00 1101	(	4D	10 1101		6D
00 1110	+	4E	10 1110	>	6E
00 1111	¦,!	4F	10 1111	?	6F
01 0000	&	50	11 0000	0	F0
01 0001	J	D1	11 0001	1	F1
01 0010	K	D2	11 0010	2	F2
01 0011	L	D3	11 0011	3	F3
01 0100	M	D4	11 0100	4	F4
01 0101	N	D5	11 0101	5	F5
01 0110	O	D6	11 0110	6	F6
01 0111	P	D7	11 0111	7	F7
01 1000	Q	D8	11 1000	8	F8
01 1001	R	D9	11 1001	9	F9
01 1010	!,]	5A	11 1010	:	7A
01 1011	$	5B	11 1011	#	7B
01 1100	*	5C	11 1100	@	7C
01 1101	)	5D	11 1101	'	7D
01 1110	;	5E	11 1110	=	7E
01 1111	¬,^	5F	11 1111	"	7F

Note: The characters above are used as attribute, AID, write control (WCC), copy control (CCC), Display/Printer Adapter and device address, and buffer address. They are also used as status and sense. When any character is received by the Display/Printer Adapter, only the low-order 6 bits are used. When any of these characters is transmitted to the program, the Display/Printer Adapter assigns the appropriate EBCDIC code.

For example, to use this table to determine the hex code transmitted for an attribute character, first determine the values of bits 2-7. Select this bit configuration in the table under Bits 2-7. The hex code that will be transmitted (either in EBCDIC or ASCII) is to the right of the bit configuration.

Use this table also to determine equivalent EBCDIC hex codes and their associated graphic characters.

Graphic characters might differ for particular World Trade I/O interface codes. Refer to the *IBM 3270 Character Set Reference manual*, GA27-2837, for possible graphic differences when these codes are used.

Figure 2-2. Control Character I/O Codes

Read Commands

Two read-type commands are executed: Read Buffer and Read Modified. Read Buffer causes the entire buffer contents of the addressed terminal to be read into main storage. The operation initiated by Read Modified is determined by display station operator actions. The information read during execution of Read Modified consists of fields of data modified by keyboard operations, or the code of a Program Function or Program Access key.

In local configurations, an operator action that requires program interaction causes an attention interrupt; the program would respond to this attention interrupt with a read command.

Programming Note: *Unsolicited read commands are not recommended because the information read by these commands may be incomplete.*

During a Read Buffer or Read Modified operation, a SUB character (3F in EBCDIC) is sent in place of any byte that has bad parity. Also a Data Check sense condition is recorded. Normal transmission of the read data then continues until the usual ending point. At that time, the operation ends by the setting of Unit Check in the ending status byte.

Read Buffer Command

Execution of the Read Buffer command causes all data in the addressed device buffer, from the buffer location at which reading starts through the last buffer location, to be transferred to main storage. This command is provided primarily for diagnostic purposes. The transfer of data begins:

1. From buffer address 0 if the Read Buffer command is unchained or if it is chained from either a Sense, Select, or No Operation command.

2. From the current buffer address if the Read Buffer command is chained from either a Write, Erase/Write, Read Modified, or another Read Buffer command. Regardless of where the transfer of data begins, data transfer from the buffer will terminate when the last character location in the buffer has been transferred, or before the last character location has been transferred when the channel byte count reaches 0.

The transferred data stream begins with a three-character read heading consisting of the AID character followed by a two-character cursor address. The contents of all buffer locations are transferred, including nulls. Start Field (SF) order codes are inserted before each attribute character to identify the beginning of each field. An example of the read data stream follows:

AID	Cursor Addr	SF (1D)	Attribute Character	Text

SF (1D)	Attribute Character	Text	SF (1D)	Attribute Character	etc.
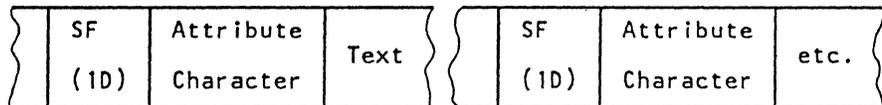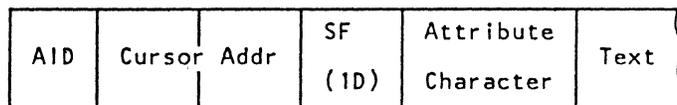
The possible cursor address byte configurations are shown in Appendix B. The possible AID (Attention Identification) byte configurations are shown in Figure 2-3 on page 2-6 . An AID configuration other than 60 or E8 is set when the operator at the selected display station has performed an operation that requires program intervention by pressing a Program Function or Program Access key. The attribute character is shown in Figure 3-3 on page 3-4 .

AID	Hex Character (EBCDIC)	Graphic Character	Read Modified Command Operation	Resultant Transfer to CPU
No AID generated (Display or Display Station) ‣	60	-	Rd Mod (Unsolicited Read or Read Modified from Host)	If performing a remote polling operation, no read operation occurs; otherwise, field addresses and text in the modified fields are transferred.
No AID generated (Printer)	E8	Y	Rd Mod	
ENTER key and & (Selector Pen Attention)	7D	'	Rd Mod	
PF 1 key	F1	1	Rd Mod	
PF 2 key	F2	2	Rd Mod	
PF 3 key	F3	3	Rd Mod	
PF 4 key	F4	4	Rd Mod	
PF 5 key	F5	5	Rd Mod	
PF 6 key	F6	6	Rd Mod	
PF 7 key	F7	7	Rd Mod	
PF 8 key	F8	8	Rd Mod	
PF 9 key	F9	9	Rd Mod	
PF 10 key	7A	:	Rd Mod	
PF 11 key	7B'	=	Rd Mod	
PF 12 key	7C'	@	Rd Mod	AID code and cursor address, followed by an SBA order, attribute address +1, and text for each modified field. Nulls are suppressed.
PF 13 key	C1	A	Rd Mod	
PF 14 key	C2	B	Rd Mod	
PF 15 key	C3	C	Rd Mod	
PF 16 key	C4	D	Rd Mod	
PF 17 key	C5	E	Rd Mod	
PF 18 key	C6	F	Rd Mod	
PF 19 key	C7	G	Rd Mod	
PF 20 key	C8	H	Rd Mod	
PF 21 key	C9	I	Rd Mod	
PF 22 key	4A	¢	Rd Mod	
PF 23 key	4B	.	Rd Mod	
PF 24 key	4C	<	Rd Mod	
Operator Identification Card Reader	E6	W	Rd Mod	
Magnetic Slot Reader and Magnetic Hand Scanner	E7	X	Rd Mod	
Selector Pen Attention space null	7E	=	Rd Mod	AID code, cursor address, and field addresses only; no data.
PA 1 key	6C	%	Short Rd	
PA 2 (CNCL) key	6E	>	Short Rd	AID code only.
PA 3 key	6B	,	Short Rd	
CLEAR key	6D	_	Short Rd	
TEST REQ and SYS REQ keys	See Test Request	0	Test Req Rd	A test request message. AID transferred on Read Buffer only.

Graphic characters for the United States I/O interface codes are shown. If a World Trade country I/O interface code is used, refer to the *IBM 3270 Character Set Reference* manual, GA27-2837, for possible graphic character differences.

Figure 2-3. Attention ID (AID) Configurations

Read Modified Command

Read Modified initiates one of three operations, as determined by operator actions at the display station:

- Read Modified

- Short Read

- Test or System Request Read.

Figure 2-3 on page 2-6 lists the operator actions and the resulting Read Modified command operation initiated by each action.

A major feature of Read Modified command operations is null suppression. The device buffer is cleared to all nulls when the operator turns power on or presses the **CLEAR** key, or when the erase portion of an Erase/Write command is executed with that device selected. Also, selected portions of a buffer can be cleared to nulls by the Erase All Unprotected command and certain orders. During Read Modified command operations, null codes are not sent.

Read Modified Operation.: During a Read Modified command, if an **AID** other than **PA** key, or **CLEAR** key is generated, all fields that have been modified by keyboard are transferred to the program. All nulls are suppressed during data transfer and thus are not included in the read data stream. As a field is modified by the operator, the modified data tag (**MDT**) bit is set in the attribute byte for that field. Then, when a read modified operation is performed, successive attribute bytes are examined for a set **MDT** bit. When the bit is found, the data in the associated field is read (with nulls suppressed) before the next attribute byte is examined.

The first three bytes of the read data stream are always the **AID** code (Figure 2-3 on page 2-6) and the two-byte cursor address; these bytes are called the "read heading."

Following the read heading is the alphameric data of each modified field. The data for each field is preceded in the data stream by a Set Buffer Address (**SBA**) order code followed by the two-byte buffer address of the first character position in that field (the attribute address +1). Thus, the read data stream when data has been modified is as follows:

```
          ┌──────────────┐
          │ AID          │ ╲
          ├──────────────┤  ╲
          │ Cursor       │   ⟩   Read Heading
          │ ─        ─   │  ╱
          │ Address      │ ╱
          ├──────────────┤
          │ SBA          │ ╲
          ├──────────────┤  ╲
          │─ Atb Adr + 1─│   ⟩   First Modified Field
          ├──────────────┤  │    (nulls suppressed).
          │ Alphameric   │  ╱
          │ Data         │ ╱
          └────~~~~──────┘
          ┌────~~~~──────┐
          │ SBA          │ ╲
          ├──────────────┤  ╲
          │─ Atb Adr + 1─│   ⟩   Second Modified Field
          ├──────────────┤  │    (nulls suppressed).
          │ Alphameric   │  ╱
          │ Data         │ ╱
          └────~~~~──────┘
```
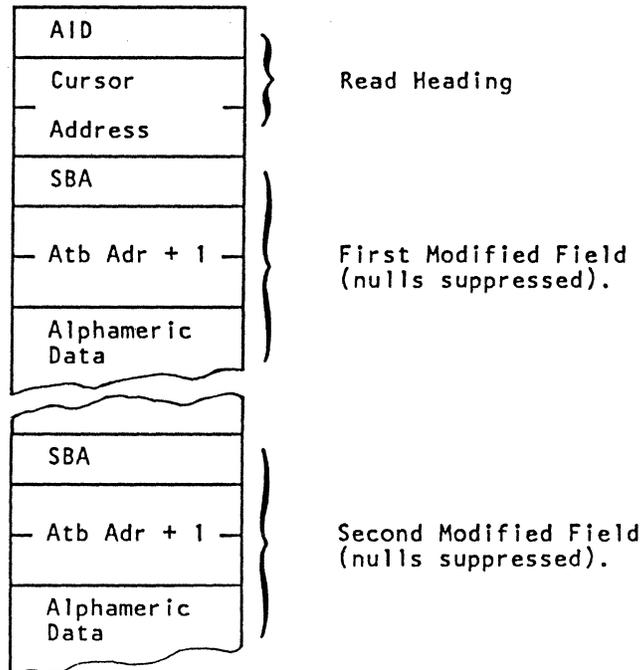
The buffer location at which the search begins for attribute bytes that define modified fields is a function of command-chaining. This location is:

1. Buffer address 0 if the Read Modified command is unchained or is chained from a Select, Sense, or No Operation command.

2. The current address if the Read Modified command is chained from a Write, Erase/Write, Read Modified, or Read Buffer command.

The search for modified-field attribute bytes ends when the last buffer location is checked or when the channel byte count reaches zero.

The transfer of read data is determined as follows:

1. If the last modified field is wrapped from the last buffer location (for example 1919) to the first location, the operation is terminated after all data in the field is transferred (nulls are suppressed). The buffer address at the end of the operation is the address of the next attribute byte in the buffer. For example, if a modified field extends from address 1900 (the attribute byte) to address 79 (wrapped field), the data from address 1901 through 79 is transferred (nulls are suppressed); in this case, the read operation is terminated with the buffer address set to 80 (the attribute byte of the next field).

2. If the buffer does not contain a wrapped modified field, and if the channel byte count has not reached zero (local operation only), the modified data stream is terminated when the last modified field is transferred; at the end of the operation, the buffer address is set to 0.

3. If the channel byte count reaches zero before all modified data is transferred, read operations are terminated and the remaining modified data is not transferred. The buffer address after termination is undefined.

If the buffer is formatted (contains fields) but none of the fields has been modified, the read data stream consists of the three-byte read heading only.

If the buffer is unformatted (contains no fields), the read data stream consists of the three-byte read heading followed by all alphameric data in the buffer (nulls are suppressed), even when part or all of the data has not been modified. Since an unformatted buffer contains no attribute bytes, no SBA codes with associated addresses or address characters are included in the data stream, and the modification of data cannot be determined. Data transfer starts at address 0, regardless of command-chaining, and continues to the end of the buffer. At the end of the operation, the buffer address is set to 0. This read operation can also be terminated by the channel byte count reaching zero before all data is read; in this case, the buffer address after termination is undefined.

Short Read: The Read Modified command causes a Short Read operation if the CLEAR, CNCL, or a PA key has been pressed at the selected device. During the Short Read operation, only an AID byte is transferred to main storage. This AID byte identifies the key that was pressed.

Test Request Read: The Read Modified command causes a Test Request Read operation if the SYS REQ (Display Station) key has been pressed at the selected device. The Test Request Read data stream sent to main storage is as follows:

SOH
%
/
STX
Input Data

Test Request
Read Heading
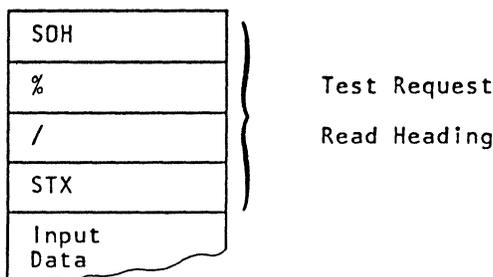
The Test Request Read heading is generated by the control unit. The remainder of the data stream is the same as described previously for Read Modified operations, excluding the three-byte read heading (AID and cursor address). If the buffer is unformatted, all alphameric data in the buffer is included in the data stream (nulls are suppressed), starting at address 0. If the buffer is formatted, each attribute byte is examined for a set MDT bit. Each time a set MDT bit is found, the alphameric data in the field associated with that bit is sent to main storage (nulls are suppressed); if no MDT bits are set, the read data stream consists of the Test Request Read heading only. The buffer location at which the search for MDT bits begins and the transfer of data ends is the same as described for Read Modified operations.

Test Request Read function usage is determined by the access method. Normally, the operation would:

1. Clear the display.

2. Enter test request data in a predefined format.

3. And then press the SYS REQ key.

Write Commands

Two write-type commands, Write and Erase/Write, are used to load, format, and selectively erase device buffer data. These commands can also initiate certain device operations such as starting the printer, resetting the keyboard, and sounding the audible alarm. Write and Erase/Write operations are identical except that Erase/Write causes complete erasure of the device buffer before the write operation is started. Thus, Erase/Write is used to load the buffer with completely new data, whereas Write can be used to modify existing buffer data. For compatibility reasons, the Erase/Write Alternate command is executed like the Erase/Write command.

Write Command

The bytes for Write command operation consist of a command code, a write control character (WCC), and any orders and/or new buffer data needed to modify the existing buffer contents. The sequence of bytes is as follows:

```
┌─────────────────────┐
│ Write — Type        │
│ Command Code        │
├─────────────────────┤
│        WCC          │    —    See following text and Figure 2 — 4.
├─────────────────────┤
│ ┌─────────────────┐ │
│ │ Orders and/or   │ │       Local and Remote Data Stream
│ │                 │ │
│ │ Buffer Data     │ │       See Figure 2 — 6 (orders),
│ │                 │ │
│ │                 │ │       and Figures 2 — 1 and 2 — 2 (buffer data).
│ └─────────────────┘ │
├─────────────────────┤
│        XXX          │       Data Link Framing Characters (Remote Only).
└─────────────────────┘
```
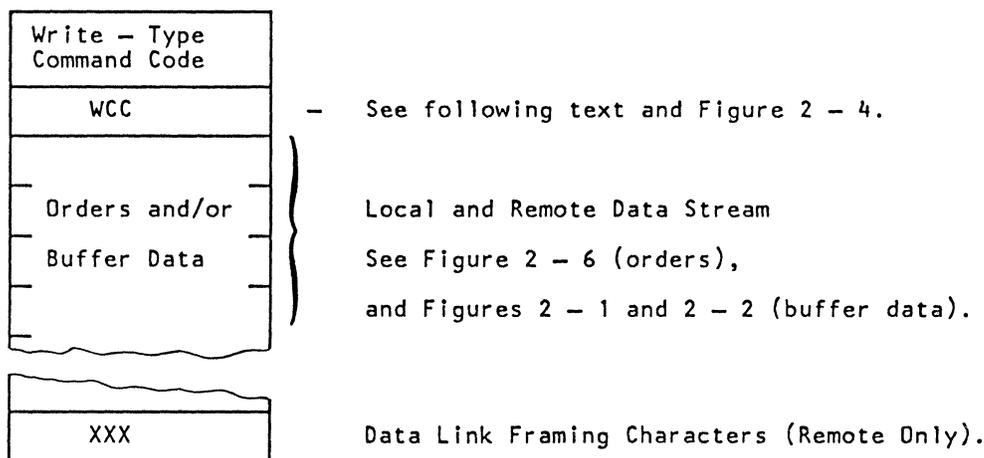
The minimum data stream following a Write command is a one-byte write control character (WCC). This is ensured since the byte count field of the write CCW must be set to a minimum of 1 in BSC operations or when attached to the Display/Printer Adapter, or else the command code is not sent. To be meaningful, a WCC byte should follow the command code.

The WCC byte format is as follows:

*	1	Printout Format		Start Print	Sound Alarm	Keyboard Restore	Reset MDT Bits
0	1	2	3	4	5	6	7

*Determined by the configuration of bits 2 through 7. See Figure 2-2 on page 2-4

Figure 2-4 on page 2-12 describes the function of each WCC bit. When the WCC specifies an operation that does not apply to the selected device (for example, if the Sound Alarm bit is set and the selected device does not have the audible alarm feature), the specified operation is ignored. When the WCC is followed by order or display/print data bytes, only the Reset MDT Bits function, if specified, is performed before the write operation; any other WCC function is deferred until all data is written and all orders are performed.

Orders and buffer data can follow the WCC character. (Orders are described later in this chapter, following the "Commands" description.) Buffer data can be written into any specified location of the buffer without erasing or modifying data in the other buffer location. Data characters are stored in successive buffer locations until an order is encountered in the data stream which alters the buffer address, or until all the data has been entered. During the write operation, the buffer address is advanced one location as each character is stored.

The buffer location where data entry starts depends upon the following considerations:

1. The starting location may be specified by a Set Buffer Address order that follows the WCC. (This order is described later in this chapter under "Orders".)

2. The starting location will be the buffer address containing the cursor if the Write command is not chained or if it is chained from a Select, Erase All Unprotected, No Operation, or Sense command.

3. The starting location will be the current buffer address if the Write command is chained from a Read or another Write command.

The formatting and placement of write data and the modification of existing buffer data are described under "Orders."

Programming Note: If the commands are being chained, the Write or Erase/Write command with the Start Print WCC bit set must be the last command in the chain. If not, the Display/Printer Adapter aborts the Write or Erase/Write command that specifies Start Print.

Programming Restriction: A Write command should not be chained from Erase All Unprotected command. If it is, the operation is undefined.

Erase/Write Command

Execution of the Erase/Write command performs two operations: an erase operation and a write operation. The erase operation clears the entire device buffer to nulls, positions the cursor to character location 0, and resets the buffer address to 0.

Erase/Write then performs the write and WCC operations in the same manner as a Write command. If no WCC is sent, the Erase/Write command will not erase the buffer.

BIT	EXPLANATION
0	Determined by the contents of bits 2 through 7 as shown in Figure 2-2 on page 2-4.
1	Reserved.
2, 3	Define the printout format, as follows: = 00 — The NL, EM, and CR* orders in the data stream determine print line length. Provides a 132-print position line when the orders are not present. = 01 — Specifies 40-character print line. = 10 — Specifies 64-character print line. = 11 — Specifies 80-character print line.
4	Start Printer bit. When set to 1, initiates a printout operation at completion of the write operation.
5	The Sound Alarm bit. When set to 1, sounds the audible alarm at the selected device at the end of the operation if that device has an audible alarm.
6	The Keyboard Restore bit. When set to 1, restores operation of the keyboard by resetting the System Lock or Wait symbol on the Display Station. It also resets the AID byte at the termination of the I/O command.
7	Reset MDT bits. When set to 1, all MDT bits in the selected devices existing buffer data are reset before any data is written or orders are executed.

* The CR order is applicable to the printers only.

Figure 2-4. Write Control Character (WCC)

Erase/Write Alternate Command

For execution see "Erase/Write Command".

Control Commands

Control commands initiate certain control unit and/or device operations not involved with the transfer of data (other than status). Three control-type commands are executed: Select, Erase All Unprotected, and No Operation.

Erase All Unprotected Command

This command performs five functions at the addressed device:

1. Clears all unprotected buffer character locations to nulls.

2. Resets to 0 the MDT bit for each unprotected field.

3. Unlocks the keyboard when either the System Lock or the Wait symbol is displayed.

4. Resets the AID byte.

5. Repositions the cursor to the first character location in the first unprotected field of the buffer. If no unprotected fields exist, the cursor is positioned to buffer location 0.

In local configurations, Erase All Unprotected is an immediate type command. Upon acceptance of this command, the Display/Printer Adapter goes "busy" and sends Channel End initial status to the channel. Upon successful completion of this command, the Display/Printer Adapter sends Device End status asynchronously to the channel and then goes "not busy".

No Operation Command

This command performs no functional operation in the Display/Printer Adapter but may be used to retrieve pending status. No Operation is an immediate command; therefore, Channel End and Device End normally will be presented as initial status unless pending status or a busy condition exists.

Sense Command

Sense should be issued in response to Unit Check status for further definition of the Unit Check condition. The Display/Printer Adapter responds to a Sense command by sending one byte of sense data to the channel and resets the sense register when the Device End (DE) for the command is taken by the channel. With the exception of a No Operation or Test I/O command, all other commands, including a Sense command to a different address for which the sense data is pending, reset the sense register immediately when the command is issued. Sense should be issued following receipt of Unit Check status to ensure that valid information is retrieved.

The sense byte configuration is as follows:

CR	IR	BOC	EC	DC	US	CC	OC
0	1	2	3	4	5	6	7

Figure 2-5 on page 2-16 summarizes the significance of each sense bit. The various sense and status bit combinations are described in Figure 5-2 on page 5-6 , Figure 5-3 on page 5-7 , Figures 5-4 on pages 5-9 and 5-10.

Sense I/O Command

Sense I/O retrieves seven bytes of attachment and device information:

```
Byte 1    =  Always X'FF'

Byte 2, 3 =  43xx CPU ID

Byte 4    =  Control Unit version.  For the Display/
             Printer Adapter the 43xx system version.

Byte 5, 6 =  Unit ID

Byte 7    =  Model number of the unit.
```

Orders

Orders can be included in Write or Erase/Write command data streams, either alone or intermixed with display print data. Two types of orders are available: printout format orders and buffer control orders. Printout format orders are initially stored in the buffer as data and are subsequently executed only during a print operation.

The following paragraphs describe buffer control orders, which are executed as they are received in the write data stream; these orders are not stored in the buffer. Six buffer control orders (see Figure 2-6 on page 2-17) are provided to position, define, and format data being written into the buffer, to erase selected unprotected data in the buffer, and to reposition the cursor.

Start Field (SF) Order

This order notifies the control unit that the next byte in the write data stream is an attribute character. (The attribute character is described in Figure 3-3 on page 3-4 .) The control unit then stores the next byte (the attribute character) at the current buffer address. As the attribute character is stored, the control unit sets a control bit at that address; this bit identifies the byte as an attribute character during subsequent program or device operations with the buffer data.

> **Note:** The byte immediately following the SF order in the data stream is always stored as an attribute character, even when the byte is intended as an order or an alphameric data character.

During execution of a Read Buffer command, the control unit automatically inserts SF order codes in the read data stream immediately before each attribute character. This permits identification of the attribute characters by the program and also permits correct storage of attribute characters in the buffer if the read data is used for subsequent write operations.

Set Buffer Address (SBA) Order

This three-byte order specifies a new buffer address from which write operations are to start or continue. Set Buffer Address orders can be used to write data into various areas of the buffer. An SBA order can also precede another order in the

data stream to specify the starting address for a PT, RA, or EUA order; to specify the address at which an attribute byte is to be stored by an SF order; or to specify the address at which the cursor is to be repositioned by an IC order.

If the SBA order specifies an invalid address (for example, greater than 1919 for a display station), the write operation is terminated at this point. The leftmost two bits are not checked for validity.

When a Read Modified command is executed and an attribute character (initially sent to the device by writing an SF order) is detected with the MDT bit set, the CU inserts, in place of the attribute, an SBA code followed by the two-byte buffer address of the first character in the modified field (attribute address +1). This permits identification by the control unit of fields that are modified.

BIT	NAME	SIGNIFICANCE
0	Command Reject (CR)	Set if the Display/Printer Adapter has received an invalid command; the valid commands are listed under "Commands".
1	Intervention Required (RI)	Set if a command, other than Sense, was addressed to a device that is unavailable or is in the "not ready" condition.
2	Bus Out Check (BOC)	(Not Used)
3	Equipment Check (EC)	Set if the Display/Printer Adapter has asynchronously detected a parity check on data received from a device in response to an internal poll for attention status (the internal poll is tried twice before EC is set) or a printer error occurs. If this is a device detected condition, Unit Specify is also set.
4	Data Check (DC)	Set if: (1) the Display/Printer Adapter or a device has detected bad parity on data transferred internally or between the Display/Printer Adapter and a device during command operations, (2) a Display Station has detected a cursor check, or (3) a device has detected a buffer check. If this is a device-detected condition, Unit Specify is also set.
5	Unit Specify (US)	Set if the sense bits resulted from a device detected error.
6	Control Check (CC)	Set when the Display/Printer Adapter has detected a timeout condition. (The addressed device fails to perform a specified operation or respond to the Display/Printer Adapter within a specified period of time.)
7	Operation Check (OC)	Set when the Display/Printer Adapter has received a valid command or order that it cannot execute, as follows: 1. SBA, RA, or EUA order specifies an invalid buffer address. 2. Write data stream ends before all required bytes of SBA, RA, EUA, or SF order sequence are received. 3. Write or Erase/Write with Start Print bit set in WCC is chained to the next command; the print operation is suppressed.

Figure 2-5. Sense Byte Description

Insert Cursor (IC) Order

This order repositions the cursor to the location specified by the current buffer address. Execution of this order does not change the current buffer address. For

example, if IC is issued when the current buffer address is 160 and the cursor is at location 80, the cursor is moved from location 80 and inserted at location 160. The current buffer address at the end of this operation would remain 160.

Program Tab (PT) Order

The PT order advances the current buffer address to the address of the first character position of the next unprotected field. If the PT is issued when the current buffer address is the location of an attribute byte of an unprotected field, the buffer address advances to the next location of that field (one location). In addition, if the PT order in the write data stream does not follow a control command, order, or order sequence such as WCC, IC, or RA (3-character sequence), nulls are inserted in the buffer from the current buffer address to the end of the field, regardless of the value of bit 2 (protected/unprotected) of the attribute character for the field. When the PT order follows a control command, order, or order sequence, the buffer content is not modified for that field.

The PT order stops its search at the last location in the buffer. If an attribute character for an unprotected field is not found by this point, the buffer address is set to location 0. (If the PT order finds an attribute character for an unprotected field in the last buffer location, the buffer address is also set to zero.)

To continue the search for an unprotected field, a second PT order must be issued immediately following the first one. Since the current buffer address was reset to 0 by the first PT order, the second PT order begins its search at buffer location 0. If the previous PT order was still inserting nulls in each character location when it terminated at the last buffer location, the new PT order will continue to insert nulls from buffer location 0 to the end of the current field.

Order	Order Sequence				
	Byte 1 (Order Code)		Byte 2	Byte 3	Byte 4
	EBCDIC (Hex)	ASCII (Hex)			
Start Field (SF)	1D	1D	Attribute Character[1]		
Set Buffer Address (SBA)	11	11	1st Address Byte[3]	2nd Address Byte[3]	
Insert Cursor (IC)	13	13			
Program Tab (PT)	05	09			
Repeat to Address (RA)	3C	14	1st Address Byte[3]	2nd Address Byte[3]	Character to be Repeated[2]
Erase Unprotected to Address (EUA)	12	12	1st Address Byte[3]	2nd Address Byte[3]	

Notes:

1. Figure 3-3 shows attribute byte and Figure 2-2 shows coding of this byte.
2. Figures 2-1 and 2-2 show coding of this byte.
3. Appendix B lists the two-byte code for each possible address.

Figure 2-6. Buffer Control Orders and Order Codes

Repeat to Address (RA) Order

The RA order stores a specified alphameric or null character in all buffer locations, starting at the current buffer address and ending at, but not including, the specified stop address. This stop address and the character to be repeated are identified by the three bytes immediately following the RA order in the write data stream, as follows:

Byte

```
  0  ┌─────────────────────────────┐
     │   RA Order                  │
  1  ├─────────────────────────────┤       See Appendix B
     │   Stop                      │    ── for Address.
     ├                           ──┤
  2  │   Address                   │
  3  ├─────────────────────────────┤    ── See Figures 2-1 and 2-1 for Codes.
     │   Character to be Repeated  │
     └─────────────────────────────┘
```

The third character following the RA order is always interpreted as the character that will be repeated. If an invalid stop address is specified, the write operation is terminated at this point without storing the character, and error status is generated.

When the stop address is lower than the current buffer address, the RA operation wraps from the bottom row of the buffer to the top row. When the stop address equals the current address, the specified character is stored in all buffer locations.

Attribute characters will be overwritten by the RA order if they occur before the RA order stop address.

Erase Unprotected to Address (EUA) Order

The EUA order inserts nulls in all unprotected buffer character locations, starting at the current buffer address and ending at, but not including, the specified stop address. This stop address is specified by two address bytes which immediately follow the EUA order in the write data stream. If an invalid address is specified, the write operation is terminated at this point and error status is generated.

When the stop address is lower than the current buffer address, the EUA operation wraps from the bottom row of the buffer to the top row. When the stop address equals the current address, all unprotected character locations in the buffer are erased.

Attribute characters are not affected by the EUA order.

Chapter 3. Displays

Display data that is stored in the buffer of the Display Stations is presented to the operator on a display screen in the form of alphanumeric characters and symbols. Because each display has a buffer, the display image can be automatically updated when the data is modified by the application program. When a keyboard is attached, input messages can be generated at the keyboard and displayed on the screen as they are composed.

The following section provides information on the functions and operation of display stations and their associated special features. No distinction is made between various keyboard special features unless they are pertinent to the topic being discussed.

Unformatted and Formatted Display Images

There is a fixed relationship between each display buffer storage location and its related character position on the display screen. Buffer address locations are referenced from 0, the first displayable character location in the upper left corner of the screen, to the last displayable character location in the bottom right corner of the screen. Buffer address layout for 1920 size displays contains 80 character positions in each row, and 24 rows (Figure 3-1 on page 3-2). By using these address locations under appropriate commands, a program can load a display station buffer with many combinations of control and data characters to present to the operator a display that exactly fits the application. A total of 96 character codes, including space and null, may be transferred to the display buffer. These include uppercase and lowercase alphameric characters; see Figure 2-1 on page 2-3 . Additionally, they include attribute characters described under "Display Fields".

An application program can communicate with a display operator using one of two basic methods. In one method, the display screen is left unformatted and the display operator uses the screen in a free-form manner. In the second method, the display image is completely or partially formatted (organized or arranged) by the application program.

The display presentation shown in Figure 3-2 on page 3-3 illustrates the flexibility available with 3270 display formatting. In this example, the visible characters represent displayed data stored in the display buffer. Character positions indicated by dotted squares represent buffer locations where control characters are stored. Dotted characters represent display data that is defined by the program as not displayable, that is, not visible to the operator. In all display presentations, control characters stored in a display unit buffer are not displayed; data characters may or may not be displayed, depending upon program definition.

```
  |◄─────────────────────80 Character Positions─────────────────────►|

        ┌─────────────┐                                    ┌─────────────┐
    ▲   │      0      │                                    │      79     │
    │   │     80      │                                    │     159     │
    │   │    160      │                                    │     239     │
    │   │    240      │                                    │     319     │
    │   │    320      │                                    │     399     │
    │   │    400      │                                    │     479     │
    │   │    480      │                                    │     559     │
    │   │    560      │                                    │     639     │
    │   │    640      │                                    │     719     │
    │   │    720      │                                    │     799     │
24 Rows │    800      │                                    │     879     │
    │   │    880      │                                    │     959     │
    │   │    960      │    1920 ─ Character Display Format  │    1039     │
    │   │   1040      │                                    │    1119     │
    │   │   1120      │                                    │    1199     │
    │   │   1200      │                                    │    1279     │
    │   │   1280      │                                    │    1359     │
    │   │   1360      │                                    │    1439     │
    │   │   1440      │                                    │    1519     │
    │   │   1520      │                                    │    1599     │
    │   │   1600      │                                    │    1679     │
    │   │   1680      │                                    │    1759     │
    │   │   1760      │                                    │    1839     │
    ▼   │   1840      │                                    │    1919     │
        └─────────────┘                                    └─────────────┘
```
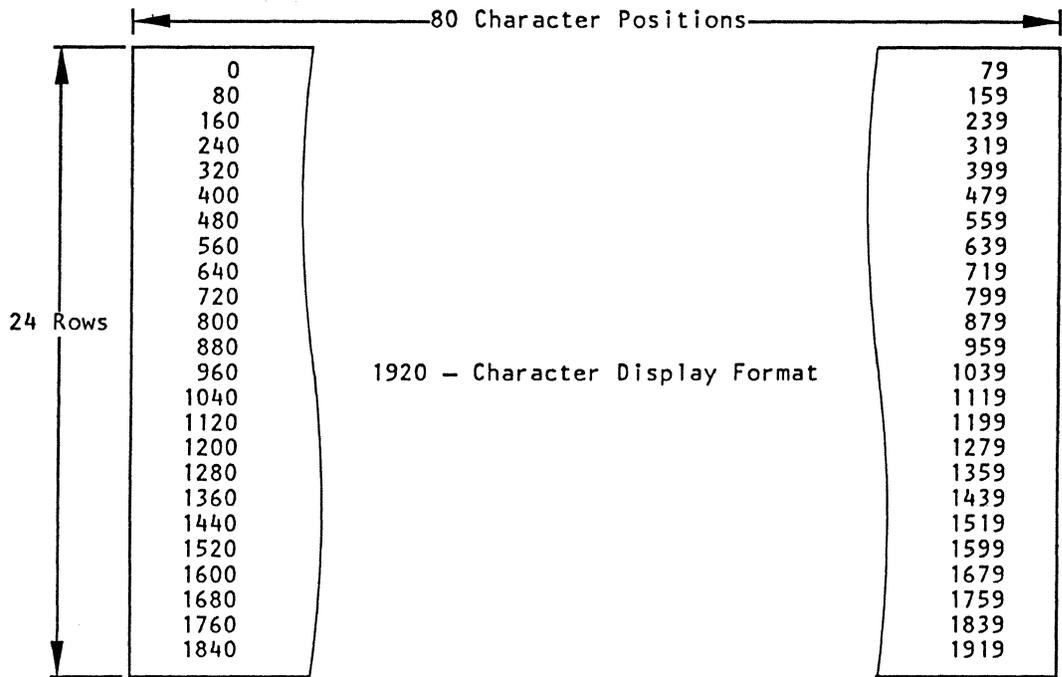
Note: See Appendix B for hexadecimal equivalents.

Figure 3-1. Buffer Addressing Layouts for 1920 Character Terminal

Display Fields

The control characters (dotted squares) shown in Figure 3-2 on page 3-3 are constructed by the program. They define the characteristics or attributes of the data that follows them and are called attribute characters. Each attribute character plus all the data following it up to the next attribute character is called a field. When a field "wraps" the screen, the field continues from the last character location in the buffer to the first location in the buffer until it is terminated by an attribute character. Figure 3-2 on page 3-3 shows eight fields.

Organizing the display data into fields facilitates display operations for the program and for the operator. Fields are also used in most 3270 programming operations: functions that involve the storage, display, printing, or transmission of data are primarily field-oriented. Some operations performed on fields that wrap the screen are terminated by the last buffer address rather than by the field terminating attribute. This effect is noted in the descriptions of the specific operations. Attribute characters, in addition to defining the start of a field, define the following field characteristics for all character locations contained in that field:

- Protected (from modification by a display operator) or unprotected (available for the operator to modify or enter data). The unprotected definition classifies a field as an input field.

- Alphameric (an input field in which an operator can enter alphabetic, numeric, or symbol characters) or numeric (has special meaning for protected fields, data entry keyboards, and the Numeric Lock special feature).

- Character display (nondisplay, display, intensified display).

- Detectable or non-detectable (by use of the selector light-pen).

- Tab stop positions (first character position of unprotected fields).


```
⌷NAME :⌷JOHN B DOE
⌷SALARY⌷1 2 8 8 8
⌷JOB TITLE :⌷WRITER
⌷PHONE #:⌷383-7628
```

Figure 3-2. Examples of Display Image Fields (Formatted Display)

Each attribute character occupies one of the character locations in the buffer, but it cannot be displayed or printed. During a display or a printout, its character location appears as a space. Figure 3-3 on page 3-4 shows the bit definition for an attribute character.

Attribute characters are treated as characters that are protected from operator intervention; that is, they cannot be replaced by alphameric characters entered from the keyboard or modified by use of the selector light-pen. However, the Modified Data Tab bit (7) of the attribute character can be changed by an operator, as described in Figure 3-3 on page 3-4 . Also, attribute characters are not protected from being overwritten by alphameric data that is included in the data stream of a Write, Erase Write, or Erase/Write alternate command. When the operator uses the CLEAR key, attribute characters and all characters in a formatted buffer are erased.

Attribute character bit assignments are summarized as follows:

X	1	U/P	A/N	D/SPD	Reserved	MDT

| 0 | 1 | 2 | 3 | 4 & 5 | 6 | 7 |

EBCDIC Bit	Field Description
0	Value determined by contents of bits 2-7. See Figure 2-2 on page 2-4 for hexadecimal values.
1	Must be set to 1.
2	0 = Unprotected 1 = Protected
3	0 = Alphameric 1 = Numeric (causes automatic upshift of data entry keyboard) Note: Bits 2 and 3 equal to 11 cause an automatic skip. See text.
4 & 5	00 = Display/not selector-pen detectable. 01 = Display/selector light-pen detectable. 10 = Intensified display/selector light-pen detectable. 11 = Non-display, non-print, non-detectable.
6	Reserved. Must always be 0.
7	Modified Data Tag (MDT); identifies modified fields during Read Modified command operations. 0 = Field has not been modified. 1 = Field has been modified by the operator. Can also be set by program into the data stream.

Figure 3-3. Attribute Character Bit Assignment. See APP. E for Color Specific Use of Attribute Character.

Keyboard Operations

Keyboards, attached to a display station, enable the operator to change, edit, or create character displays except within field defined by attribute characters as protected from keyboard operations by the program. As messages are being composed or modified by keyboard operations, the changes are inserted in the buffer and then displayed. When the operator completes an operation and presses the ENTER or AID generating key, an I/O pending interrupt occurs.

Cursor

A special symbol, called a *cursor*, is displayed on the display screen to indicate where the next character entered from the keyboard will be stored. The cursor may appear as an underscore, as a blinking underscore, or as a rectangular or

blinking rectangular symbol imposed over a character. The character within the rectangular cursor remains visible. The operator may change the cursor from an underscore to a rectangular symbol, or vice versa, by pressing the alternate cursor (ALT CURSR) key. The same operator may cause either type cursor to blink by using the cursor blink (CURSR BLINK) key. When the cursor is displayed under one character in a line of characters, that character can be changed or deleted by keyboard action. Also, if the cursor is displayed under (or within) a position without a display character, a character can be entered in that position by keyboard action.

One, and only one, cursor must always be in the display buffer. A cursor check occurs when the display station circuitry detects no cursor or more than one cursor in the buffer. When the display is turned on, the cursor is automatically generated and displayed in the first location on the screen. The cursor can be repositioned by the keyboard operator and also by the program. The cursor is not affected by field attributes nor by the Security Keyload special feature; it is displayed even when positioned in a non-displayed/non-print field and when the Security Keyload special feature (if installed) is turned off.

Keyboards

Three types of keyboards are available: typewriter, data entry and data entry-keypunch layout. All keyboards have special symbol keys and control keys for entering data. The type of keyboard determines the characters and symbols that can be transmitted from the system for the display image.

Key Functions

Alphabetic characters can be entered into the display buffer in either uppercase or lowercase code, depending upon the position of the shift key, from the typewriter or operator console keyboard. In addition, only uppercase alphabetic codes can be entered from data entry keyboards. Alphabetic characters are displayed as uppercase or lower characters, as determined by the setting of the mono/dual switch (Aa/a switch).

Keyboard entry of an alphanumeric character into the display buffer occurs at the cursor location, provided the cursor is located in an alphameric character location within an unprotected data field. (An attempt to enter an alphameric character into a protected data field or into an attribute character location is blocked.) Successful keyboard entry of the alphanumeric character causes the cursor to advance to the next character location within the unprotected data field.

> Note: The following descriptions of key functions are applicable to all keyboards, except where noted. Operator Information Area symbols referred to as "Input Inhibit" symbols in this chapter, are designated as "Do Not Enter" symbols in Figure A-2 on page A-3 Appendix A.

The ALT key must be held to activate functions shown on the front of keys on the attached keyboards. These functions are: SYS REQ, CLEAR, ERASE INPUT, IDENT, TEST, DEV CNCL, PF1 - PF12, PA1, PA2, ALT CURSR, and HOME. The ALT key is also used with the →►► (Right) and ◄◄— (Left) key to move the cursor two locations at a time instead of one. Using the ALT key with a key that has no associated function produces no effect.

Automatic Skip

Upon entry of a character into the last character location of an unprotected data field, the cursor is repositioned according to the attribute character describing the next field.

If the attribute character defines the next field as (1) alphameric and either unprotected or protected, or (2) numeric and unprotected, the cursor skips the attribute character and is positioned to the first character location in that field.

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

Character-Oriented Keys

A cluster of four keys (located to the right of the main keyboard) moves the cursor one location at a time into any character location. These are: ↑ (Up), ↓ (Down), → (Right), and ← (Left). A fifth key, the backspace key, occupies its normal position on the new keyboard. It performs the same functions as the move-cursor-left key. The cursor may be moved into any character location, including unprotected and protected alphameric character and attribute character locations, through the use of these keys. Operations of these keys do not affect the MDT bit. The ↑ (Up), and ↓ (Down) keys move the cursor one location at a time. The → (Right) and ← (Left) keys can move the cursor one location at a time. When the ALT (Alternate) key is pressed and held, the →▶▶ (Right) and ◀◀ (Left) key will move the cursor two locations at a time.

These keys are all capable of causing the cursor to wrap. Horizontal wrap always involves a vertical movement; the cursor repositions to the next or preceding row of characters. Vertical wrap due to operation of the Up or Down keys involves no horizontal movement; the cursor stays in the same character column.

These keys all have typamatic operation at a repeat rate of approximately ten operations per second. (When a typamatic key is fully pressed, its function is repeated as long as the key is held pressed.)

Field-Oriented Keys

Any of four keys move the cursor to the first position in a field on a formatted screen. All four key operations can cause the cursor to wrap from the end of the last line on the display and to continue at the beginning of the top line. Operation of these keys does not affect the MDT bit.

→| (Tab) Key - Moves the cursor to the first character location of the next unprotected data field. In a display with no unprotected fields, the cursor is repositioned to character location 0. The Tab key has typamatic capability at a repeat rate of approximately ten operations per second.

|← (Backtab) Key - When the cursor is located in the attribute character position or the first alphameric character location of an unprotected data field or any character location of a protected data field, this key moves the cursor to the first alphameric character location of the first preceding unprotected data field. When the cursor is located in any alphameric character location of an unprotected data

field other than the first location, this key moves the cursor to the first alphameric character location of that field. In a display with no unprotected fields, the cursor is repositioned to character location 0. The Backtab key has typamatic capability.

◄─┘ (New Line) Key - Moves the cursor to the first unprotected character location of the next line. If the display has no unprotected data fields, the cursor is repositioned to character location 0. If the display contains no fields, the cursor is repositioned to the first character position of the next line. The New Line key has typamatic capability at a rate of approximately ten operations per second.

⌐⍀⌐ (Home) Key

- Moves the cursor to the first unprotected character position on the display screen.

ERASE EOF (Erase to End of Field) Key

If the cursor is located in an alphameric character location in an unprotected data field, this key clears the character location occupied by the cursor and all remaining character locations to the right in that field to nulls. The operation can wrap from the end of the last line on the display to the end of the field. The cursor does not move as a result of operating this key, and the MDT bit is set to 1.

Operation of this key when the cursor is located in an attribute character location or is within a protected data field causes an input inhibit condition and disables the keyboard; no character locations are cleared, the cursor is not moved, and the MDT bit is not set.

ERASE INPUT Key

This key clears all unprotected character locations to nulls, resets MDT bit to 0 in unprotected fields, and repositions the cursor to the first unprotected character location on the screen.

The alternate (ALT) key must be pressed and held first.

In a buffer with only protected data fields, no character locations are cleared and the cursor is repositioned to character location 0.

If the display contains no field, the entire buffer is cleared to nulls and the cursor is repositioned to location 0.

â (Insert Mode) Key

The Insert Mode key places the keyboard controls in an insert mode of operation. The insert symbol is displayed in the Operator Information area on the display screen.

If the cursor is located in an unprotected data field having a null character either in the character location identified by the cursor or in any character location in the field beyond the cursor, operation of an alphameric key causes that alphameric character to be entered at the cursor and the MDT bit to be set to 1. The character formerly occupying the cursor location and all remaining characters within the field (except for null characters or characters to the right of null characters)

will be shifted one character location to the right. If the location identified by the cursor location at the time of the insert operation is a null, no character shifting occurs.

After all null characters at or beyond the cursor location in the field have been overwritten, or if there were no null characters, operation of an alphameric key causes the keyboard to become disabled. Attribute characters remain in their fixed character locations and are not shifted as part of the insert operation.

If more than one row of characters is contained within the field, a character occupying the last character location in the row is shifted into the first character location of the next row.

Operation of an alphameric key while in insert mode when the cursor is located in an attribute character location or is within a protected data field, disables the keyboard; no character locations are cleared, the cursor is not moved, and the MDT bit is not set.

Operation of the **RESET** key, **ENTER** key, or any other key that causes host communication returns the keyboard to normal mode.

⌦ (Delete) Key

If the cursor is located in an alphameric character in an unprotected field, operation of the Delete key will delete the character from the character location occupied by the cursor and set the **MDT** bit to 1 (if it had not previously been set). The cursor will not move. All remaining characters in the unprotected field, to the right of the cursor and on the same row, will shift one character location to the left. Vacated character locations at the end of the row will be filled with nulls. If the unprotected field encompasses more than one row, characters in rows other than the row identified by the cursor will not be affected.

Operation of this key when the cursor is located in an attribute character location or is within a protected data field disables the keyboard; no character locations are cleared, the cursor is not moved, and the **MDT** bit is not set.

RESET Key

The **RESET** key is used to recover from an inhibited keyboard operation that has resulted in a disabled keyboard. When a keyboard is disabled, no other keyboard operations are honored. The **RESET** key will not reset a disabled keyboard when a command is being executed for the device to which the keyboard is attached, or when a parity error or cursor check is detected in the device buffer.

When a keyboard is disabled, symbols are displayed on the bottom row of the screen. Pressing **RESET** restores the keyboard Time or Security key input inhibited condition. Pressing **RESET** once resets multiple input inhibited conditions. Operating **RESET** after an **AID** generating key has been depressed will not cancel the **AID** code and I/O pending but will restore the keyboard.

DUP (Duplicate) Key

Operation of this key causes a unique character code to be entered into the display buffer, a Tab key operation to be performed, and the **MDT** bit to be set to 1. The **DUP** key is provided only on the typewriter, data entry, and data entry key-

punch layout keyboards. The **DUP** character provides a means of informing the application program that a "duplicate" operation is indicated for the rest of the field in which it is located. The **DUP** character is transferred as a **DUP** code (Figure 2-1 on page 2-3) when the data is read from the display to the program. No duplicate operation is performed at the Display/Printer Adapter. The **DUP** character, when stored in a device buffer, is displayed as an asterisk (*) using monocase mode and is also printed as an asterisk (*) on a printer. On displays using dual-case mode, **DUP** is displayed as an asterisk with an overscore (*).

Operation of this key when the cursor is located in an attribute character location or is within a protected data field disables the keyboard; no character locations are cleared, the cursor is not moved, and the **MDT** bit is not set.

FM (Field Mark) Key

Operation of this key causes a unique character code to be entered into the display buffer and the **MDT** bit to be set to 1. The field mark character provides a means of informing the application program of the end of a field in an unformatted buffer or subfield in a formatted buffer. The field mark character is transferred as an **FM** code (Figure 2-1 on page 2-3) when the data is read from the display to the program. The field mark character, when stored in a device buffer, is displayed as a semicolon (:) using monocase mode, and is also printed as an asterisk (*) on a printer. On displays using dual-case mode, **FM** is displayed as a semicolon with an overscore.

Operation of this key when the cursor is located in an attribute character location or is within a protected data field disables the keyboard; no character locations are cleared, the cursor is not moved, and the **MDT** bit is not set.

Program Attention Keys

These keys solicit program action by causing an I/O pending to occur at the display terminal. The program is notified of the interruption by an Attention status indication. An Attention identification (AID) character is generated at the time of the interruption to identify which key caused the interruption, but the **MDT** bit is not affected.

The program attention keys are: **CLEAR, ENTER,** the Program Function (PF) keys, and the Program Access (PA) keys. The operation of the **CLEAR** key also clears the display screen of all data to nulls (except the indicator row), and positions the cursor at location 0,0 on the display. It does not change shift status except that it will remove the **NUM** symbol, if displayed. It does not perform a reset function. While in Test mode the **CLEAR** key does not cause an AID to be sent to the host.

SYS (System) REQ Key.: The SYS REQ key performs the Test Request function. The automatic reset function is not available. Refer to "Test Request Read" under "Read Modified Command" in Chapter 2. The **ALT** key must be pressed and held while the SYS REQ key is pressed.

⇧ SHIFT Key

Shift keys perform the upshift function. When the typewriter keyboard becomes ready initially, only characters located on the bottom position of the key tops can be entered from the keyboard. By pressing and holding a shift key, characters

LOCK Key 🔒

shown on the top position of the key tops can be entered. The shift "up" state is indicated to the operator in the Operator Information area on the display screen. Pressing a shift key will reset the lock key.

The lock key fixes upshift character selection. A lock key is deactivated by pressing a shift key. When using a shift key on a typewriter keyboard, the shift state is indicated to the operator in the operator information area on the display screen.

NUMERIC Key ⇧

The NUMERIC key on the data entry and data entry-keypunch layout keyboards, is used to perform the upshift function, equivalent to the shift keys on the typewriter keyboards. The "up" shift state is indicated to the operator in the Operator Information area on the display screen.

ALPHA Key ⇩

When the data entry or data entry-keypunch layout keyboards have been programmed for non-alpha shift, characters shown on the bottom of the key tops can be selected by holding the ALPHA key and entering the desired characters. When power is applied, the keyboard is in lower case alpha mode.

ATTN (Attention) Key

The ATTN key is inoperative and will cause Input Inhibit Minus function when pressed.

CURSR (Cursor) BLINK Key

Pressing the CURSR BLINK key causes the cursor (either the bar or the rectangular cursor) to blink. Activating the key again will cause the blinking to stop.

ALT CURSR (Alternate Cursor) Key

Pressing the ALT CURSR key while holding the ALT key changes the cursor display. The underlined type of cursor is changed to a rectangular cursor. Conversely, the rectangular cursor is changed to the underlined type cursor by activating the ALT CURSR key.

TEST Key

The TEST key on the display keyboard is used to invoke test functions resident in the Display/Printer Adapter. Pressing the TEST key (while holding ALT key) clears and resets the display screen, and the Test mode indicator turns on. The Display/Printer Adapter places the device to be tested in test mode, and the operator identifies the test function desired. The operator terminates Test mode by pressing the ALT/TEST again.
The Display in Test mode generates Unit Check and Intervention Required if addressed by a command. When Test mode terminates normally, status with device end is generated.

DEV CNCL (Device Cancel) Key

The operator may use **DEV CNCL** to cancel a current outstanding print request to a printer if input is inhibited because of a Printer Busy condition. A request initiated by the Print key is dequeued, and the keyboard is restored. The Printer Busy symbol is replaced by the printer assignment symbol.

DEV CNCL is also used to remove Device Not Functional conditions.

The **ALT** key must be pressed and held while the **DEV CNCL** key is pressed, to cancel a request and restore the keyboard.

If no copy printer is assigned, **DEV CNCL** gives Invalid Function symbol. Use of **DEV CNCL** in other situations results in no indication.

CLICK Key

A clicking sound may be produced as keys are pressed on keyboards attached to displays. The clicking sound is controlled by operating conditions such as Input Inhibit. For example, if the clicking sound is enabled and an Input Inhibited condition occurs, the key click is then disabled, and vice versa. By pressing the **CLICK** key, the operator can activate the clicking sound if it had been turned off or prevent clicking if it had been activated.

PRINT Key

The **PRINT** key is used to initiate a local copy function from a keyboard attached to a display. Pressing the print key during a running copy operation results in Invalid Function symbol.

IDENT Key

The **IDENT** key is used to assign a printer for a local copy function. (The **ALT** key must be pressed to activate the **IDENT** key.) When the **IDENT** key is pressed, the cursor disappears from the screen, and the Printer Assignment symbol appears with two underlined characters in the "nn" position. The operator may then enter the port number of the desired printer in the "nn" position. When in **IDENT** mode, the following rules apply:

1. Numeric information is accepted at the "nn" position in the indicator row. Each character is then checked for validity.

2. Any other keys or functions or not valid port numbers cause **IDENT** mode to be terminated. The contents of the original default matrix are displayed besides Invalid Function. The cursor appears, and the keyboard is locked. The operator must reset and then retry the **IDENT** sequence. If the selected port is valid (a printer port), the Printer Assignment indicator will show the new connection, and print **IDENT** mode is terminated. The cursor reappears, and the keyboard remains unlocked.

CURSR SEL (Cursor Select) Key

The **CURSR SEL** key allows the selector-light-pen-detection function to be performed from the keyboard. The **CURSR SEL** key may be used on any field defined as a selector-light-pen-detectable field. However, a cursor-select field

does not require the space or null character padding constraints associated with the selector-light-pen-detectable field and cursor-select can occur within the field on a line different from that of the attribute that describes the field.

Cursor Select operations may be immediate or deferred (as defined for selector-light-pen fields).

The field used for cursor-select operation may also be defined in the following format:

- Attribute character as defined for selector light-pen.

- Designator character as defined for selector light-pen.

- Data character(s) optional.

- Attribute character next field.

This format is not applicable when using the selector light-pen. When defining a cursor-select field, the attribute character may not be located in the last line of the display with the designator character in the first line.

Numeric Lock Feature Operations

When the Numeric Lock feature is installed, the numeric characters (0-9), decimal sign, minus sign (-), and DUP may be entered by the operator in a field identified in the attribute byte as numeric and unprotected. Operation of any other key which can enter a displayable character, lights the INPUT INHIBITED indicator. In addition, the NUM symbol lights on. Operation of the RESET key enables the keyboard (if disabled), and the INPUT INHIBITED light or NUM symbol goes out. The non-display/non-print attribute bits 4 and 5 and MDT bit 7 operate normally. The Numeric Lock feature is disabled while the ALPHA key is operated on data entry keyboards or the shift keys are operated on typewriter keyboards.

On a typewriter keyboard, the characters that can be entered in the field identified in the attribute byte as numeric and unprotected are (0-9), decimal sign, and minus sign (-); in addition, when the SHIFT or the LOCK key is operated, the DUP character may be entered by the operator.

Dead Keys, Canadian French Keyboards (˙ ˊ ˜ ¨ ˛)

When pressed, the accent keys which show individual accents on the Canadian French keyboards appear on the display, but the cursor does not move. These accent keys are referred to as dead keys. A subsequent character which receives the accent must be keyed next. If the subsequent character is valid, a unique composite character is formed. Refer to the *IBM 3270 Character Set Reference* manual, GA27-2837, for keyboard layouts, I/O codes, and identification of valid accent characters.

All other non-keyboard-related functions that occur during a dead key sequence are performed normally. If performance of the function causes the dead key sequence to be aborted, the keyboard is inhibited and What is displayed after the function has been performed.

In all of these conditions, the dead key sequence is aborted, and an accent only is displayed at the cursor position. The operator must reset and rekey both the accent and the valid character.

Security Keylock

The Security Keylock is a security-enhancement special feature that provides a key-controlled lock for the displays. When the key is in the "off" position or is removed from the display station, the message buffer is "locked" , which prevents entry, modification, and display of data. The display station is unavailable to programmed read or write operations and operator inputs such as keyboard entry.

Programmed attempts to access display stations that have the key turned off or removed from the lock result in responses being returned to the CPU by sending UC plus IR Status and Sense for all read or write commands.

Local Copy Function

In addition to processing print commands, the D/P Adapter provides a local copy function which allows direct data transfer from a display station to a printer attached to the same adapter. The local copy function is directed by a print-control matrix. The print-control matrix is called the Default Matrix.

The print key □-□ on a keyboard attached to a display station may be used by the operator to initiate a local copy request. The local copy request is serviced by a printer selected under control of the print control matrix.

3276 Default Matrix

At the time the D/P Adapter issues a Reset to each attached terminal and the terminal responds positively, it is posted in the Default Matrix. The matrix identifies each terminal in ascending order, by port. For example:

```
Port          0    1    2    3    4    5    6    7
Terminal      D    D    P    P    D    D    P    P
Assignment    X    02   X    X    06   06   X    X

Note:   X = not applicable
```

Displays (D) are assigned the first printer (P) occurring at a higher port number. In this example, display terminal will be assigned at port 1, the printer on port 2. Display terminals on ports 4 and 5 are assigned the printer on port 6.

If power is off at a terminal when the Reset is issued, nothing is posted in the matrix for that terminal. The D/P adapter assumes that the device at that port is a display. Power off at ports 1, 4, or 5 does not alter the definition of the matrix in this example. Power off at ports 2 and 3 (printer) results in display terminal at port 1 being assigned to the printer at port 6.

If a terminal is powered off after it has been posted in the matrix, the terminal is considered "not ready" . The matrix is not altered. Thus, if the printer at port 2 is powered off after being posted in the print matrix, a not-ready condition would

be signalled if a local copy operation is attempted by the display at port 1. However, by forcing a **D/P Adapter** reset (for instance **IPL**), printer 2 is removed from the Default Matrix, which then appears:

```
Port          0    1    2    3    4    5    6    7
Terminal      D    D    X    P    D    D    P    P
Assignment    X    03   X    X    06   06   X    X
```

Note: X = not applicable

If a terminal is initially powered off, and then powers on some time after the Reset, the **D/P Adapter** is notified, and the matrix is updated. For example, if the printer attached to port 6 was not powered on, the Default Matrix appears as:

```
Port          0    1    2    3    4    5    6    7
Terminal      D    D    P    P    D    D    X    P
Assignment    X    02   X    X    07   07   X    X
```

Note: X = not applicable

Applying power to a printer at port 6 at a later time will change the assignments for displays 4 and 5 to printer 6, as in the previous examples.

As configured in the first example, the printers attached to ports 3 and 7 will not be used for local copy from display stations. They are available for uninterrupted use by the host for direct print command operations. The printers on ports 2 and 6 may also be used by the host for direct print command operations. In this case, copy operations may have to wait by execution of print requests. On the other hand, print command will get "Busy" if the printer is engaged in a local copy operation.

Printer Selection

The **IDENT** key on the keyboard of the display station, may be used to change the printer assigned by the Default Matrix as described under "IDENT Key". For example, by using the **IDENT** key and keying 03 at the display attached to port 1, the Default Matrix becomes:

```
Port          0    1    2    3    4    5    6    7
Terminal      D    D    P    P    D    D    P    P
Assignment    X    03   X    X    06   06   X    X
```

Note: X = not applicable

By forcing a **D/P Adapter** reset, the original Default Matrix is restored.

Operator-Initiated Copy

The operator may initiate a local copy operation by pressing the **PRINT** key on the display keyboard. The **D/P Adapter** will then attempt to execute the local copy function on the printer with port number shown in the "Printer Assignment" indicator in the display indicator row. If the printer is free, the "Printing" symbol

is displayed and the keyboard is unlocked. All data is transferred from the display buffer to the printer buffer and subsequently printed. Upon completion, the "Printer Assignment" indicator will be displayed.

If the printer is busy (local copy operations for other displays or print commands), the "Input Inhibited Printer Busy" symbol is displayed. The request is queued and the keyboard is locked until the printer ends its operation and handles the pending copy request(s). Then the above sequence is initiated. The operator, however, can cancel the local copy request by pressing the **DEV CNCL** key. This turns off the Input Inhibited indicator, unlocks the keyboard, and dequeues the print request. The operator is then free to perform another task.

If the printer is not functional because of an "intervention required" or "permanent error" condition, then the "Input Inhibited Printer Not Working" symbol is displayed and the keyboard is locked. The print request is queued. The operator may wait until the printer becomes ready or depress the **DEV CNCL** key to continue. This action turns off the Inhibited indicator and unlocks the keyboard. The operator may then choose an alternate action like selecting another printer. If the operator attempts to print and the selected printer is used as a 1052 copy device, the "Input Inhibited Printer Not Working" symbol appears. The print request is not queued. **DEV CNCL** and selecting another printer are appropriate operator actions.

Chapter 4. Printer

The terminal printers are used to provide a printed copy of information that is displayed at a display station or of information written from the program. Printed data appears in the same alphameric characters and symbols that appear on a display, and printouts can be formatted in the same manner as a display. Cursor information is ignored by the printer.

Print Line Formatting

Printout operations are specified by a write command or a copy command addressed to the printer. The print line format in which the data is to be printed from the buffer can be specified as part of the command in one of three printer formats. These formats simply define the print line length: 40, 64, or 80 character positions per line. If a format is not specified, the print line length is 132 character positions.

Printer Orders

Printer orders are transferred as part of the data stream from the application program. They are stored in the buffer as data.

New Line (NL) and End of Message (EM) (All Printers)

The **NL** order is executed only when encountered during an unformatted printout, that is, a printout that does not have a line-length format specified. When an **NL** order is encountered in the buffer, the printer performs a new line function. If no **NL** order is encountered before the printer reaches the end of a line (as determined by the maximum plate length), the printer automatically performs a new line function and continues printing. If an **NL** order is encountered at one character position past the maximum platen length, the terminal printer will perform two new line functions.

The **NL** order is not executed when located in a non-display/non-print field; it is treated as an alphameric character and printed as a space. In addition, the **NL** order is not executed when encountered during formatted printout. Instead, it is printed as a space character.

For buffered printer operation (described under "Buffered Printer Operation"), the **EM** order is executed only when encountered during an unformatted printout. The **EM** order is not executed when located in a non-display/non-print field; it is treated as an alphameric character and printed as a space. In addition, the **EM** order is not executed when encountered during formatted printout. Instead, it is printed as a space character. When an **EM** is encountered, the printing operation is terminated. None of the data following the **EM** order in the buffer is printed.

Forms Feed (FF)

Valid forms feed (FF) orders are executed by the terminal printer during either formatted or unformatted printouts. (The FF order is completely described in the section "Page Length Control/VFC Operations.") When a valid FF order is

encountered in the first print position of a line, with the Page Length Control/VFC feature installed, the print form indexes to a predetermined print line on the next form.

Carriage Return (CR)

When the Carriage Return (CR) order code is found in the data stream, the next print position will be the left-most character position on the current print line. CR orders are not executed when they occur in non-print fields and when the printer format bits in the WCC indicate a line length (40, 64 or 80 characters). In both cases, the CR order is printed as a space character.

Buffered Printer Operations

When a command specifying a printout is received from the system, the data of the addressed printer is transferred to the printer buffer. If the WCC start bit is set to 1, the printout starts after the control unit-to-printer buffer transfer is completed.

During the print operation, if line format is specified, data characters in the printer buffer are scanned one line at a time before they are printed. A line feed is executed after each line is printed. If a line contains one or more space characters only, a line feed is performed to cause a blank line in the printout. When null characters, attribute characters or alphameric characters in non-print field are encountered, they are treated as follows:

1. If embedded in a print line, they are printed as spaces.

2. If they constitute an entire line, they are ignored and the line feed is not performed; as a result, a blank line does not appear in the printout, and the data is compressed vertically one line.

When line-length format is not specified, printout of the buffer data begins at buffer location 0 and continues until the last position of the buffer is printed or until a valid EM character is encountered. Each print line is left-justified. At the end of each printout, a final line feed is executed so that the printer is ready to start the next printout. When the print-terminating EM order appears in the first print position of the print line, a final line feed is not executed because the printer is already positioned at the left margin for the next printout.

Page Length Control/VFC Operations

The ability to index forms vertically under program control to a predetermined print line is provided by the Page Length Control specify feature for the terminal printer. Special links and preprinted forms containing index marks are not required to make this feature operational.

When a valid Forms Feed (FF) order is encountered in the buffer during a printout, the form indexes to a predetermined line. Printing begins on the predetermined line; the first print position, the buffer location containing the FF character, is printed as a space character. Printing and indexing continues until the printout is terminated. The printer is "busy" while printing and indexing.

There is no limit on the number of FF orders that can be included in the printer buffer or on the frequency of their occurrence. However, for an FF order to be considered valid and thus initiate indexing, the printer must be equipped with the Page Length Control/VFC feature, and FF characters must be placed in buffer locations corresponding to the first position of a print line in a field designated either print or non-print. This can be accomplished by placing the FF character in the following locations:

1. The first character after the WCC in a Write or Erase/Write data stream to the printer.

2. After a valid NL or CR order.

3. The first character position of any print line (for example, in character position 41 in a buffer with a line-length format of 40 characters per line specified, or in character position 133 in a buffer without a line-length format specified.)

An FF order in any other position in the printer buffer or in a printer without Page Length Control/VFC is considered invalid: the index operation is not executed, and the FF character prints as a space character except when the FF order is located in a non-print field. A valid FF order prints as a space character.

During printing, if a valid FF order is encountered when the form is located at the predetermined index stop line, the index operation will be executed, and a blank form will result. The printer will not skip a blank form.

Before beginning Page Length Control/VFC printouts, forms must be loaded in the printer and aligned to the print line where indexing should stop and printing begin. If the forms are not aligned properly while initially being loaded, all forms will be misprinted. The Page Length Control/VFC circuitry synchronizes with the index stop line on the form as the cover is closed and the printer goes from Not Ready to Ready. If the cover must be raised or if a Not Ready condition occurs, the form must be checked to ensure that the index stop line is in the proper position before reclosing the cover.

The two Page Length Control/VFC selector switches must be set to the number corresponding to the total number of print lines from one index stop line to the next for each index stop lines. When uniform length forms are used, the setting for the switches is computed by multiplying the forms length in inches by the 6 or 8 lines-per-inch setting. (For example, when 11-inch forms are installed on the terminal printer, the switches should be set at 66.) The maximum form length, fold-to-fold when operating at 8 LPI, is 12.375 inches.

Programming Notes:

1. *If an NL order and an FF order appear on the last line of a terminal printer printout and VFC is installed, subsequent printing will begin on a new form.*

2. *Page Length Control is synchronized when power is applied or when the FF switch is pressed.*

Chapter 5. Local Operations

The Display/Printer Adapter operates program and data stream compatible with 3274-1B Control Unit. Data and control information is transferred in bursts of up to 256 bytes per burst. The Display/Printer Adapter is considered to be a part of the byte multiplexer channel of the 4361 Processor with channel address zero.

Selection

The 4361 Processor detects the **SIO** in the instruction stream and determines the attachment based on the channel, control unit, and device address. The address range from 009 to 01F is reserved for the devices on the Display/Printer Adapter and the user diskette.

The configuration is set up by selecting the Native Display and Printer Configurator from the Customer Manual Operation functions. See *Operator's Library: IBM 4361 Processor Operating Procedures*, GA33-1570.

The following parameters have to be entered per port of the coax connectors:

- Device type

- Keyboard/language combination
  One or two keyboard language combinations may be ordered and are displayed on the configuration picture.

- Device address out of the range of 009-01F
  Any double definition or out-of-range is checked.

With the next **IML**, any change in the configuration becomes active. Removing a device physically does not necessarily require a change of the configuration. The open port answers with unit check and **IR** when addressed.

The channel program controls all Display/Printer Adapter operations by transmitting information. This information consists of:

1. An address, which selects the device (display or printer) attached to the Display/Printer Adapter.

2. Command bytes, which specify the type of operation to be performed by the Display/Printer Adapter for that device.

3. Data bytes, which are either stored in the printer buffer for ultimate use by the selected device as display or printout or are decoded as orders and used by the Display/Printer Adapter for formatting the buffer.

4. Various control signals.

Status bytes, which are automatically generated by the Display/Printer Adapter, inform the channel program:

1. Of the general condition of the Display/Printer Adapter and selected device at various stages of command operations.

2. Of unique conditions of the Display/Printer Adapter and any attached device when command operations are not in progress.

Interface Operations

Local interface operations are summarized in the following paragraphs and are described in detail in the *IBM System/370 Principles of Operations* manual, GA22-7000. The CPU program initiates control unit operations with a Start I/O instruction. This instruction identifies the Display/Printer Adapter and device and causes the channel to fetch a channel address word (CAW) from a fixed location in main storage. The CAW designates the storage protection key and the location in main storage from which the channel subsequently fetches the first channel command word (CCW). The CCW specifies the command to be executed and the number and address, in main storage, of any bytes to be transmitted.

Command Initiation

Command operations by the Display/Printer Adapter start when the Display/Printer Adapter is successfully selected. When a command is to be executed by the Display/Printer Adapter (not by the channel alone), the 4361 Processor channel code sends the command code (CCW bits 0-7) to the Display/Printer Adapter.

When execution of the command involves a transfer of data (such as Write or Read Modified), the control unit responds to the command with a status byte (called "initial" status) indicating whether it can execute the command. If the command can be executed, the channel is set up to respond automatically to data requests from the Display/Printer Adapter and the Display/Printer Adapter assumes further control of the operation. Command operation can be terminated by the Display/Printer Adapter or when the channel byte count reaches 0. At this time, the Display/Printer Adapter sends the channel a second status byte (called "ending" status) which indicates whether the command operation was successfully performed.

When the function of the command does not involve the transfer of data (such as EAU), it is called an "immediate" command. The resulting Display/Printer Adapter operation depends on the particular command, as follows. If the command is No Operation or Select, ending status and initial status are combined to indicate to the channel that the Display/Printer Adapter has completed execution of the command. If the command is Erase All Unprotected, which initiates certain Display/Printer Adapter and device operations, the initial status from the control unit channel ends. When command execution is completed by the Display/Printer Adapter and selected device, the Display/Printer Adapter sends ending status to the channel, indicating whether the command was successfully performed.

Chaining

When the channel has completed the operations specified by a CCW, it can continue the activity initiated by the previous Start I/O by fetching a new CCW, thereby restarting the cycle. The fetching of this new CCW is called "command-chaining", and the CCWs belonging to such a sequence are said to be chained. All CCWs in a chain apply to the Display/Printer Adapter and device specified by the original Start I/O instruction.

Either of two types of chaining can be specified by the current CCW (bits 32 and 33): data-byte chaining or command-chaining. During data chaining (current CCW bits 32=1), the new CCW fetched by the channel defines a new main storage area (data address) for the current command. During command chaining (current CCW bits 33=1), the new CCW specifies a new command and a data address for that new command.

Thus, when command-chaining is used, the Display/Printer Adapter is selected following the Start I/O instruction when the channel receives the first CCW in the chain that involves operations with the Display/Printer Adapter. The Display/Printer Adapter is totally dedicated to one CCW string until final Channel End time or until operations are abnormally terminated. Programming restrictions that must be observed when command-chaining is used are described under "Commands" and "Orders" in Chapter 2.

Status

The Display/Printer Adapter generates a status byte to inform the channel of certain Display/Printer Adapter device conditions. This status byte can be generated synchronously (while the Display/Printer Adapter is selected and performing a command operation with the channel) or asynchronously (while the Display/Printer Adapter is not selected).

Synchronous status is passed to the channel as both "initial" and "ending" status to a command. Initial status reflects the condition of the selected device and/or Display/Printer Adapter upon receipt of a command and indicated to the channel whether the command can be executed. Ending status reflects the condition of Display/Printer Adapter and selected device after all channel/3270 interface operations of a non-immediate command are completed. Asynchronous status reflects:

1. Ending status for an immediate command other than No Operation or Select.

2. A second ending status for a Write or Erase Write command, indicating that the Display/Printer Adapter-to-device buffer transfer is completed or

3. An equipment condition or operator action not associated with command execution (an attention).

Figure 5-1 on page 5-5 describes each bit of the status byte. Status is reset by the Display/Printer Adapter once it has been accepted by the channel.

Initial Status

Initial status is generated by the Display/Printer Adapter in response to initial selection, by the channel, of the Display/Printer Adapter and an attached device. During the initial selection sequence, the status byte is sent to the channel after the control unit receives a command.

Figure 5-2 on page 5-6 shows the possible initial status bit configurations. An all-zero status byte is sent when a non-immediate command is accepted for execution by the control unit; it is also sent in response to Test I/O if other status is not pending. The Unit Check bit is set if the command is not accepted by the Display/Printer Adapter because of a program or equipment error.

Initial status to immediate commands is as follows. For No Operation and Select, Channel End and Device End are both set to indicate completion of the command. For Erase All Unprotected, which does not involve data transfer between the channel and the Display/Printer Adapter, Channel End is set. When command execution is completed, ending status is presented asynchronously.

When status is pending (a previous status byte is awaiting transfer to the channel), the waiting status byte, with the Busy bit set, is sent to the channel in response to any command (not to a Test I/O instruction), and that command is not accepted by the Display/Printer Adapter. For Test I/O, the waiting status byte is presented without the Busy bit set.

BIT	NAME	CONDITION
0	Attention (A)	Indicates a request for service from a display station attached to Display/Printer Adapter. Set as result of certain keyboard activity at display station (Figure 2-3 on page 2-6). Program should respond by issuing a Read Modified command to the display station requesting attention.
1	Status Modifier (SM)	Not used.
2	Control Unit End (CUE)	Not used.
3	Busy (B)	Is set alone in initial status byte when addressed device is busy because it is performing a print operation or an Erase All Unprotected command. When the channel addresses a device other than the one that is busy and Display/Printer Adapter is not busy, addressed device becomes selected and the command is honored. Busy bit is also with pending status if addressed device has such status.
4	Channel End (CE)	Indicates channel data transfer operations are completed. Is set alone (1) in initial status for Erase All Unprotected command, or (2) as ending status for Write and and Erase/Write; in all cases, Device End status is sent asynchronously when device operations (command or control unit-to-device buffer transfer) are completed. Is set with Device End, to indicate that Display/ Printer Adapter and device operations (except printing) are completed (1) in initial status for No Operation or Select command, in ending status for Read Buffer, Read Modified, or Sense command, or (3) asynchronously if only Channel End status was pending and the device operation is completed before the channel accepts status.
5	Device End (DE)	Indicates that Display/Printer Adapter and device have completed all command operations and are free to execute another command. Is set (1) in initial status for No Operation or Select command, (2) in ending status for Read Buffer, Read Modified, or Sense command, and (3) in asynchronous status for Write, Erase/Write, or Erase All Unprotected command.
6	Unit Check (UC)	Is set when an irregular program or equipment condition is detected by Display/Printer Adapter or the device. Program should always respond to Unit Check status by issuing a Sense command for further definition of condition.
7	Unit Exception (UE)	Not used.

Figure 5-1. Status Byte Bit Assignments for the Display/Printer Adapter

STATUS* (HEX)	SENSE (HEX)	DIS- PLAY	PRIN- TER	ERROR REC. PROC.	CONDITION
All Zeros (00)		X	X		Normal status for any command other than No Operation, Select, or Erase All Unprotected.
CE (08)		X	X		Normal status for an Erase All Unprotected command.
CE, DE (0C)		X	X		Normal status for a No Operation or Select command.
UC (02)	IR (40)	X	X	2	A command other than Sense was addressed to a device that the Display/Printer Adapter has re- corded as "unavailable" or "not ready".
UC (02)	CR (80)	X	X	3	An invalid command was issued to the Display/Printer Adapter.
B (10)		X	X		Response to a command addressed to a device which is being ser- viced by the Display/Printer Adap- ter or which is completing a pre- viously issued command.

* If an **SIOF** is executed by the channel, unchained initial sttus becomes becomes ending status.

Figure 5-2. Initial Status and Sense Conditions for Display/Printer Adapter

Ending Status

When the Display/Printer Adapter completes channel operations for a non-immediate command, it sends an ending status byte to the channel, freeing the channel for other operations. This status byte always relates to the command operation that has been executed. The normal ending status byte for a Read Buffer, Read Modified, or Sense command will have only the Channel End and Device End bits set, indicating that the command has been executed. Normal ending status for a Write or Erase/Write command is Channel End alone. When the Display/Printer Adapter-to-device buffer transfer is completed, thus ending the command operation, Device End status is sent to the channel as asynchronous status. Any error condition associated with the operation just executed will cause additional status bits to be set. Figure 5-3 on page 5-7 shows the possible ending status bit configurations. Ending status causes an I/O interruption unless chaining is specified.

STATUS (HEX)	SENSE (HEX)	DIS-PLAY	PRIN-TER	ERROR REC. PROC.	CONDITION
CE (08)		X	X		Sent at end of data stream or a Write or Erase/Write command.
CE, DE (0C)		X	X		Sent at end of data stream on a Read Buffer, Read Modified, or Sense command or when channel byte count goes to zero on a Read Modified or Read Buffer command.
CE, DE, UC (0E)	DC (08)	X	X	1	The Display/Printer Adapter detected a cursor, or parity check during receipt of data stream on a Write or Erase/Write command.
CE, DE, UC (0E)	DC (08)	X	X	5	The Display/Printer Adapter detected a cursor, or parity check during transmission of data stream on a Read Buffer or Read Modified command.
CE, DE, UC (0E)	CC (02)	X	X	5	Addressed device failed to respond in a specified period of time to an Erase/Write command or an unchained Read Buffer, Read Modified, or Write command.
CE, DE, UC (0E)	0C (01)	X	X	3	The Display/Printer Adapter received an invalid buffer address in data stream of a Write or Erase/Write command, or data stream ended before providing all characters required for an SBA, RA, SF, or EUA order on a Write or Erase/Write. Note, that the two leftmost bits of the buffer address are not checked for validity.

Figure 5-3. Ending Status and Sense Conditions for Display/Printer Adapter

Asynchronous Status

Asynchronous status reflects:

1. The ending status of an "immediate" command other than No Operation or Select.

2. The second ending status for a Write or Erase/Write command, indicating that all command-initiated operations are completed.

3. An action by the device operator that requires program intervention (attention status).

Figures 5-4 on pages 5-9 and 5-10 show the possible asynchronous status bit configurations.

This status is called "pending" status until selection is accomplished. If the channel issues a command before retrieving this pending status, the pending status is returned, with the Busy bit set, in place of initial status for the command; in this case, the command is not executed, unless it is a Test I/O instruction.

When an asynchronous condition occurs at a device while the Display/Printer Adapter is performing command operations with another device, the asynchronous status remains pending until the Display/Printer Adapter completes the current command operation, returns ending status to the channel, and becomes not busy. The Display/Printer Adapter then retrieves the pending status from the device and attempts to present it to the channel in the same manner as other asynchronous status.

Some other conditions of multiple status that can occur are not covered here. These conditions can be caused by multiple error conditions occurring simultaneously.

Error-Recovery Procedures

Error conditions detected by the Display/Printer Adapter or an attached device are indicated to the program by Unit Check status. The program must respond to this status by using a Sense command for further definition of the condition. Subsequent recovery operations are then determined by the combined configurations of Unit Check status bits and associated sense bits.

STATUS (HEX)	SENSE (HEX)	DIS-PLAY	PRIN-TER	ERROR REC. PROC.	CONDITION
A (80)		X			An attention-generating action (e.g., program access key has been depressed) was performed by the operator.
DE (04)		X	X		The Display/Printer Adapter-to-device buffer transfer is completed on a Write or Erase/Write command which did not start a printer. The device becomes "not busy" after completing the Erase All Unprotected command or the printer becomes "not busy" after completing a printout. A device changes from "not available" to "available" or from "not ready" to "ready". A device becomes "not busy" after having previously sent CC1 and previously sent CC1 and Busy when the Display/Printer Adapter attempted to execute a command with the device when it was "busy".
DE,UC (86)	IR (40)		X	4	The addressed printer became Not Ready (out of paper or cover open) before completion of a print operation, or a command attempting to start a printer found in Not Ready.
DE,UC (06)	IR,EC, US(54)		X	4	A printer became mechanically disabled during a printout and an automatic recovery was not successful. The printer CARRIAGE MOTOR POWER switch was off or the switch fuse was blown.
DE,UC (06)	IR,EC, US (54)		X	4	A command attempted to start a print operation, but the printer CARRIAGE MOTOR POWER switch is turned off. A printer character generator or sync check error occurred or the printer became mechanically disabled during printout, but restored itself.

Figure 5-4 (Part 1 of 2). Asynchronous Status and Sense Conditions for Display/Printer Adapter

STATUS (HEX)	SENSE (HEX)	DIS-PLAY	PRIN-TER	ERROR REC. PROC.	CONDITION
DE,UC (06)	DC (08)	X	X	5	During an Erase/Write command, the Display/Printer Adapter (1) detected a parity or cursor error, or (2) detected a parity check on data received from the addressed device in response to an internal poll during a command.
DE,UC (06)	DC (08)	X	X	1	During a Write command, the control unit (1) detected a parity or cursor error, or (2) detected a parity check on data received from the addressed device in response to an internal poll during a command.
DE,UC (06)	OC (01)	X	X	3	A Write or Erase/Write command, containing a WCC with a Start Print bit is chained to a subsesequent command.
DE,UC (06)	CC (02)	X	X	5	The addressed device failed to respond in a specified period of time to a Write, Erase/Write, or Erase All Unprotected command.

Figure 5-4 (Part 2 of 2). Asynchronous Status and Sense Conditions for Display/Printer Adapter

Figure 5-2 on page 5-6, Figure 5-3 on page 5-7 , and Figures 5-4 on pages 5-9 and 5-10 list the initial, ending, and asynchronous status and sense bit combinations, respectively. The following abbreviations are used in these figures:

- **Status Bits**

    B   - Busy
    CE - Channel End
    DE - Device End
    UC - Unit Check

- **Sense Bits**

    CC - Control Check
    CR - Command Reject
    DC - Data Check
    EC - Equipment Check
    IR   - Intervention Required
    OC - Operation Check
    US - Unit Specify

Referenced Error-Recovery Procedures

The recovery procedures referenced in the Error Recovery Procedure column of Figure 5-2 on page 5-6 , Figure 5-3 on page 5-7 , and Figures 5-4 on pages 5-9 and 5-10 are as follows:

1. Reconstruct the entire buffer image and retry the failing chain of commands. The sequence of commands used to reconstruct this image should start with an Erase/Write command. If, after two retries, the problem is not corrected, follow procedure 4.

2. The error indicates the device is "unavailable." Request and wait for operator intervention to "ready" the device; then, upon receipt of DE status, retry the chain of commands.

3. A non-recoverable program error has occurred. Examine the data stream to locate the problem.

4. The error indicates the printer is out of paper, has the cover open, or has a disabled print mechanism. Request operator intervention to "ready" the printer; then, upon receipt of DE status, retry the print operation by issuing a Write command with the proper WCC and no data stream. (There is no data error; the data is still intact in the device buffer and can be reused.) If this procedure is unsuccessful, follow procedure 1.

5. Retry the failing chain of commands. If, after two retries, the problem is not corrected, follow procedure 1. A Write command to a Display/Printer Adapter can be retried if new fields have not been created in the buffer portion which has been cleared by a Program Tab or Erase Unprotected to Address order.

Channel-Detected Errors

Errors detected by the channel are indicated to the program by the channel status byte in the CSW. If the channel status byte indicates a Channel Control Check, an Interface Control Check, or a Channel Data Check, the recommended error-recovery procedure is to retry the chain of commands. If the problem is not corrected after three retries, request maintenance for the channel that is giving trouble.

5-12   Processor Display/Printer Adapter Component Description

Appendix A. Indicators and Controls

This appendix describes the indicators and controls associated with each 3270 unit. The indicators and controls are grouped as follows:

Figure A-1   Indicators and Controls for 3278 Display Station
Figure A-2 on page A-3 3278 Operator Information Area Symbols
Figure A-3 on page A-6 Indicators and Controls for 3287 Printer.

For explanation of indicators for other devices refer to respective I/O documentations.

Indicator or Control (Note 1)	3278
Operator Front Panel:	
Audible Alarm Tone Amplitude (Ctl)	A
Brightness / Test ☼ (Ctl)	X
Contrast ◗ (Ctl)	X
Dual Case/Mono Case (A, a/A) (Sw)	X
High Voltage / Power On Reset (Ind) - Light 2	X
Normal / Test (Sw)	X
Power On (Ind) - Light 3	X
Power On (│)/Power Off (○) (Sw)	X
Sweep (Ind) - Light 1	X

Key: Sw   — Switch
      Ctl — Control
      Ind — Indicator
      X   — Basic
      A   — Audible Alarm Feature

Note:
3278 Operator Information Area symbols are listed and explained
in Figure A-2 on page A-3.

For additional Indicators or Controls for 3279 and 3287 models 1C and 2C, see Appendix E.

Figure A-1. Indicators and Controls for 3278 Display Station

Audible Alarm Tone Amplifier: This control allows adjustment of the audible alarm, when the Audible Alarm Feature has been installed on the display. The Audible Alarm Tone Amplifier control is attached to the Contrast control, located below the **NORMAL/TEST** switch near the lower-right corner of the **CRT**.

Brightness/Test: This is a dual-function control. Rotating the control clockwise increases CRT brightness. Rotating the control completely clockwise and holding the control, places the control in the Test Intensity Override position which unblanks the CRT screen. The Brightness/Test control is located near the lower-right corner of the **CRT**.

Contrast: The Contrast control controls **CRT** contrast and is located above the Brightness/Test control.

Dual Case/Mono Case Switch: When in the Mono Case (A) position, only upper-case characters are displayed. When in the Dual Case (A,a) position, uppercase and lowercase characters can be displayed. This switch is located on the right side of the **CRT**.

High Voltage/Power On Reset: The High Voltage Power On Reset indicator should light up after power is applied. This indicator is located in the upper-right position on the left side of the **CRT**.

Normal/Test: This switch, when placed in the Test position, disconnects the display from the attached Display/Printer Adapter to allow testing operations. The Normal/Test switch is located on the right side of the **CRT**.

On: The On indicator lights up when normal power is available in the unit. The On indicator is located above the Power On/Power Off switch on the left side of the **CRT**.

Power On/Power Off: The Power On/Power Off switch applies and removes internal power.

Sweep: This indicator is located to the left of the High Voltage/Power On Reset indicator on the upper-left side of the **CRT**. The Sweep indicator should light up after power is applied.

Readiness and System Connection Symbols (Locations 1 through 6)

Symbol	Name	Explanation
A		Online A. The Display/Printer Adapter is connected to the system under A rules.
TEST	Test	The display station is in Test mode. Test mode is initiated or terminated by pressing the TEST key while holding the ALT key. TEST is displayed in positions 3 through 6. Test zero and test seven are described in Appendix E.

Do Not Enter (Input Inhibited), locations 9 through 15: All of these symbols contain an "X" in position 9 (do not enter), combined with other symbols in positions 11 through 15, which define why input is disabled. The keyboard does not lock mechanically, but a change in state of the keyboard clicker (on to off, or off to on) indicates that the keyboard is disabled.

The following keys are not disabled: RESET, SYS REQ, ATTN, TEST, DEV CNCL, shift keys, ALT CURSR, Blink, and clicker keys.

Symbol	Name	Explanation
X ⌖	Time	Time is required for the system to perform a function. This symbol is displayed due to: 1. A keyboard that has been locked by the host; for example, during a host-initiated print operation. 2. Internal processing constraints of the control unit.
X -S	Minus Symbol	The symbol keyed is not available. The RESET key should be pressed to restore the keyboard.
X ↑NUM	Numeric	This symbol appears when the Numeric Lock feature is installed. A non-numeric entry was made at a display screen location reserved for numeric information. RESET should be pressed to restore the keyboard, and the operation should be retried.
X ⌐ ∩∩∩	Machine Check (Color only)	The display station is not working properly. The symbol is accompanied by three digits which define the probable cause of the problem. See Appendix E for more details.
X⊏-f	Minus Function	Requested function not implemented in this controller.
X ⌐	Security Key	The security key is turned off and no operator input can be accepted. When the key is turned on, this symbol disappears, but any other pre-existing do-not-enter condition may then be displayed.

Figure A-2 (Part 1 of 3). Operator Information Area Symbols

| Symbol | Name | Explanation |

RESET does not remove the Security Key symbol. The shift key, ALT CURSR, CURSR BLINK, Clicker key and associated symbols, and all other non-input disabled symbols will function when the Security Key symbol is displayed. The Security Key has priority over other input-disabled symbols except when machine checks prevent communication between the control unit and the terminal.

X←⅄→   *Go Elsewhere*

An action has been attempted which is invalid for the display screen location. RESET should be pressed and either the cursor should be moved or some other action taken.

The Go Elsewhere symbol appears when an attempt is made to enter, insert, erase, or delete a character when the cursor is in a protected field or at an attribute location.

Locations 16 through 21

X ⅄>   *More Than*

This symbol means that the operator has attempted to enter too much information into a field. RESET should be pressed to restore the keyboard, and the operation should be retried and the entry corrected.

X ⅄´+?   *Accent Plus*
X ⅄ˎ+?   *What*
X ⅄ˆ+?
X ⅄¨+?
X ⅄ʲ+?

These messages indicate that an invalid dead key/character key combination was entered (Canadian French keyboard only). RESET should be pressed to restore the keyboard, and a valid dead key/character key combination should be entered. Valid combinations are as follows:

´ à Á é É ù Ú

/ è É

^ â Â ê Ê î Î ô Ô û Û

¨ ë Ë ï Ï ü Ü

ç ç Ç

For further information refer to "Dead Keys, Canadian French Keyboards" in Chapter 3.

X?+   *What?*

The last input was not accepted. The What symbol appears when keystrokes are being queued during an unsolicited write or buffer transfer and the capacity of the queue is exceeded. (The queue is not processed in this case.)

Because of uncertainty about what was accepted, the operator should check the contents of the screen before repeating the operation. In addition, if ALT or a shift key was used, press the key again and then press RESET and retry the operation.

Figure A-2 (Part 2 of 3). Operator Information Area Symbols

Symbol	Name	Explanation

Shifts and Modes (Locations 39 through 43):

| ⇧ | *Upshift* | The keyboard is in upshift. |

Note: After a screen update (for instance WRITE, and/or changing of cursor position or attribute characters) the shift indicator reflects the shift status before the update. The shift indicator and shift mode will be adapted with the first, subsequent keystroke.

| ⋀ | *Insert* | The keyboard is in insert mode. A character may be inserted at the cursor location. Characters beyond the cursor position move to make room for the inserted character. |
| | *NUM* | The cursor is in a numeric lock field. |

Printer Status (Locations 58 through 65):

| ▭—▭ⁿⁿ | *Printer Assignment* | The display station is authorized to use printer address number nn. Individual printers may be assigned address numbers 1 through 15. |

The number "nn" can be altered by IDENT action or a reset (for instance IPL or Power On).

▭—▭ __	*Assign Printer*	When the operator changes the assigned printer using the Print IDENT key, the two numbers appear in the assignment columns, replacing the underlines.
▭—■	*Printer Printing*	The printer is printing information from the display station.
✗▭—▭	*Printer Busy*	The printer assigned to the display station is busy. The operator may either wait for the printer to become available or press the DEV CNCL key. DEV CNCL will cancel the request, remove the Device Busy symbol, and restore the keyboard.
✗▭—▧	*Printer Not Working*	The printer assigned to the display station is not functioning. If this symbol appears after the Print key was pressed, the DEV CNCL key should be pressed to restore the keyboard, cancel the request and remove the Printer Not Working symbol. Restoration of the printer will not automatically remove the Printer Not Working symbol. If the Printer Printing symbol was displayed, the printer stopped during the last print operation.

The display terminal indicator may precede a comparable indicator on the printer by as much as 2 minutes. This symbol is displayed too if the printer is currently used as 1052 hardcopy device.

Figure A-2 (Part 3 of 3). Operator Information Area Symbols

Indicator/Control	Explanation
Ready	This light indicates that the printer is ready to print the data received from the controller. It is turned off under any of the following conditions: • Hold Print condition • Test mode • Check conditions • Power off • The printer runs out of paper.
Hold Print	This light indicates that the Hold Print or Set Alternate condition has been entered. It remains on continuously in the Hold Print condition and blinks in the Set Alternate condition.
CU Signal	This light indicates that the 3287 is connected to a control unit and communication can take place. It is turned off when the printer does not receive a signal from the control unit for 30 seconds or when the printer is in test mode.
8 LPI	This light indicates that vertical line-spacing of eight lines per inch is being performed by the printer. If 6 LPI is selected with the Change LPI switch and the control unit specifies 8 LPI, this light comes on only when printing is performed. The light shows the setting of the Change LPI switch when the printer is in the Hold Print condition.
Check	This light indicates the detection of an error condition by the terminal printer. It is turned off when all check conditions have been removed. The type of check condition is displayed in the Status indicator when the Check light comes on.
Double Space	This light indicates that double line-spacing is being performed by the printer. If single space is selected by the Change Space switch and the control unit specifies double space, this light comes on only when printing is performed. When the printer is in the Hold Print condition, this light shows the setting of the Change Space switch.
Test	This light indicates that the automatic built-in tests are running in the terminal printer. It is turned off at the ending error-free ending of all the tests.
Dual Case	This light indicates that dual case printing is being performed by the printer. If mono case (uppercase only) is selected by the Change Case switch and the control unit specifies dual case (both uppercase and lowercase), this light is on only when printing is being performed. When the printer is in the Hold Print condition, this light shows the setting of the Change Case switch.

Figure A-3 (Part 1 of 5). Indicators and Controls for the Terminal Printer

Indicator/Control	Explanation
Status	The Status indicator displays a two-digit code that represents the current status of the 3287, such as:

- A check condition
- An end-of-forms condition
- Printer Status Information
- The result of a test operation in which an error has been detected.

Refer to "Appendix C. Status Indicator Codes," for status indicator codes. The *IBM 3287 Printer Problem Determination Guide,* GA27-3151, contains a list of all the error codes and the actions the operator is to take when a code appears.

**Hold Print/
Enable Print**

Pressing this switch to the Hold Print position causes the terminal printer to stop printing after it has completed the function in process. The print head moves to the leftmost position, the Hold Print light comes on, the Ready light goes off, and data is held in the printer buffer for additional printing.

The Set Alternate, Change LPI, Change Space, Change Case, Form Feed, Setup, Index, Cancel Print, Buffer Reprint, PA1, and PA2 switches are operational only when the printer is in the Hold Print condition.

Selecting Enable Print causes the Hold Print light to go off and the Ready light to come on. Printing then continues, following the preceding print position.

Pressing the Hold Print switch on and off within 10 minutes does not have any effect on communication with the control unit.

If the operator leaves the printer in the Hold Print condition for more than 10 minutes, an "Intervention Required" message is sent to the control unit. The operator must then press the Enable Print switch to return to normal operation.

Change LPI

This switch is used to select vertical line-spacing between lines. When either 6 or 8 LPI is selected by the switch, the LPI selection by the host or the control unit supersedes the switch selection.

If printing is being done in the 8 LPI format, or if the 8 LPI switch is pressed while the terminal printer is not printing data, the 8 LPI light comes on. When a power-on reset is performed, the printer is initialized to the 6 LPI condition (the 8 LPI light is off). Reset has no effect on the switch setting.

Note: If the platen has been moved by hand, line-spacing from the first to the second print line may be out of specification since the platen does not have mechanical indexing, but all lines printed after the second line will be in specification. Care should be taken, therefore, when the platen is adjusted by hand to align first print line. Maladjustment can cause the first and second print lines to touch when the 8 LPI format is selected.

Figure A-3 (Part 2 of 5). Indicators and Controls for the Terminal Printer

Indicator/Control	Explanation
Set Alternate/Set, Parameter/Reset, Alternate Switches	Pressing the Set Alternate switch when the printer is in the Hold Print condition, activates the alternate function for all of the operator panel switches and causes the Hold Print light to flash on and off.

An operator can enter the maximum print position (MPP), using the hundreds, tens, and units alternate function switches, when the 3287 is in the alternate function mode of operation. Each time the Tens or Units switch is pressed, the Status indicator is incremented by 10 or 1, respectively. Pressing the Hundreds switch causes the Status indicator to flash for a 1XX selection and to remain on continuously, for a 0XX selection. Once the MPP has been entered, pressing the Set Parameter switch causes the MPP selection to be saved for future use and to enter a Hold Print condition.

Pressing the Reset Alternate switch before pressing Set Parameter causes the printer to return to the primary functions of the switches in the Hold Print condition without storing a newly set MPP value (the Hold Print light is on continuously). The MPP is initialized to 132 when a power-on reset is performed. Reset and test modes have no effect on the MPP selection. The MPP selection is valid only when processing information data.

Change Space	This switch, when set to Double Space, causes the printer to perform double line-spacing during printing. When a power-on reset is performed, the printer is initialized to a single space condition (the Double Space light is off). Reset mode and test mode have no effect on the switch setting.
Change Case	Selecting mono case with this switch causes the printer to print in uppercase characters only. Selecting dual case causes the printer to print in dual case (both uppercase and lowercase characters). The Dual Case light comes on for dual case printing. During a power-on reset, the printer is initialized to a mono case condition (the Dual Case light is off). Reset mode and test mode have no effect on the switch setting.
PA1 and PA2	These switches are operational only when the SCS Support feature is installed. Pressing either switch causes the printer to send a control code to the control unit and to display a function code in the Status indicator. The control unit and the printer communicate with each other and perform the operation the host program has defined for the PA1 and PA2 switches. When this is completed, the Status indicator light is turned off. These switches are active only when the Hold Print light is on and the printer is operating in SCS mode. Note that the D/P Adapter does not support SCS mode.
Form Feed	This switch is operational only if the Page Length Control feature or the SCS Support feature is installed, and it is active only in the Hold Print condition. The page size is defined by the operator using the Selector switches or by the host program in SCS mode. The page size defined by the host program supersedes the one defined by the Selector switches.

Figure A-3 (Part 3 of 5). Indicators and Controls for the Terminal Printer

Indicator/Control	Explanation

Pressing this switch causes the printer to advance the forms until the first print line of the next page is reached, if the forms have been properly aligned and its page size has been properly defined.

Buffer Reprint

This switch is operational only if the 3274/3276 Attachment feature is installed and the Hold Print light is on. Pressing this switch when the 3287 is in the Hold Print condition sets up a buffer reprint (if earlier conditions permit it), and a buffer reprint code is displayed in the Status indicator. An "operator check" code is displayed if a buffer reprint is not allowed. Pressing the Enable Print switch restarts printing at the beginning of the print buffer if the buffer reprint is allowed. When it is completed, normal operation is restored to the printer.

A buffer reprint is allowed under the following conditions:

1. An end-of-forms condition occurs while printing is being performed in non-SCS mode. The operator does the following:

   a. Presses the Hold Print switch within 60 seconds of the end-of-forms condition.

   b. Clears the end-of-forms condition and loads the forms.

   c. Presses the Buffer Reprint switch; the buffer reprint code is then displayed in the Status indicator.

   d. Presses the Enable Print switch within 10 minutes after the Hold Print switch was pressed.

2. The Hold Print switch is pressed while the 3287 is printing a non-SCS message. The operator does the following.

   a. Presses the Buffer Reprint switch; the buffer reprint code is then displayed in the Status indicator.

   b. Presses the Enable Print switch within 10 minutes after the Hold Print switch was pressed.

Note: When Buffer Reprint is pressed while processing SCS data, IR is returned to the control unit for recovery by the user application program. A reprint of the entire chain will occur if supported by the application program.

Setup

This switch is used for forms alignment and can be activated only when the 3287 printer is in the Hold Print condition. Pressing this switch causes the printer to print "H" characters continuously until the MPP is reached. The print head then returns to print position 1 without movement of the forms. When operating in SCS mode, the print head returns to the maximum print position.

Figure A-3 (Part 4 of 5). Indicators and Controls for the Terminal Printer

Indicator/Control	Explanation
Index	Pressing the Index switch causes the printer to advance forms continuously.
Reset	This switch is used to reset a check condition and to turn off any error indications. The printer indexes one line and printing continues if allowed by the control unit.
Cancel Print	This switch is operational only if the SCS Support feature is installed. Pressing this switch when the Hold Print light is on causes the printer to stop printing, to display a "cancel selected" code in the Status indicator, and to send a code for canceling the print operation to the control unit if the printer was processing an SCS message. If the printer was not printing SCS data, pressing the Cancel Print switch causes an "operator check" code to be displayed in the Status indicator.
Test	Pressing this switch causes the printer to enter test mode. When the Terminal Printer is in test mode, it cannot communicate with the control unit.
Power (I/O)	The Power switch controls power to the Terminal Printer. The 1 position is the "on" position, and the 0 position is the "off" position.
Selector	The Selector switches are two-digit, 10-position switches located on the operator's panel, used to specify the number of lines that can be printed on a form, from 00 through 99. Forms feeding is performed when the Form Feed switch is pressed or a forms-feed control code is received in the data for the number of lines specified. The page-length value is read from the Selector switches during a power-on reset or when the Forms Feed switch is pressed while the 3287 is in the Hold Print condition. The Page Length Control feature must be installed for these switches to be operational. These switches are not operable for SCS print operations.
Set Function	Reserved for future use.

Figure A-3 (Part 5 of 5). Indicators and Controls for the Terminal Printer

Appendix B. Buffer Address I/O Interface Codes

Mod 1 R C	Mods 2,3,4 R C	Position Dec Hex	EBCDIC		ASCII		Mod 1 R C	Mods 2,3,4 R C	Position Dec Hex	EBCDIC		ASCII	
01 01	01 01	0000 0000	40	40	20	20	02 23	01 63	0062 003E	40	7E	20	3D
01 02	01 02	0001 0001	40	C1	20	41	02 24	01 64	0063 003F	40	7F	20	22
01 03	01 03	0002 0002	40	C2	20	42	02 25	01 65	0064 0040	C1	40	41	20
01 04	01 04	0003 0003	40	C3	20	43	02 26	01 66	0065 0041	C1	C1	41	41
01 05	01 05	0004 0004	40	C4	20	44	02 27	01 67	0066 0042	C1	C2	41	42
01 06	01 06	0005 0005	40	C5	20	45	02 28	01 68	0067 0043	C1	C3	41	43
01 07	01 07	0006 0006	40	C6	20	46	02 29	01 69	0068 0044	C1	C4	41	44
01 08	01 08	0007 0007	40	C7	20	47	02 30	01 70	0069 0045	C1	C5	41	45
01 09	01 09	0008 0008	40	C8	20	48	02 31	01 71	0070 0046	C1	C6	41	46
01 10	01 10	0009 0009	40	C9	20	49	02 32	01 72	0071 0047	C1	C7	41	47
01 11	01 11	0010 000A	40	4A	20	5B	02 33	01 73	0072 0048	C1	C8	41	48
01 12	01 12	0011 000B	40	4B	20	2E	02 34	01 74	0073 0049	C1	C9	41	49
01 13	01 13	0012 000C	40	4C	20	3C	02 35	01 75	0074 004A	C1	4A	41	5B
01 14	01 14	0013 000D	40	4D	20	28	02 36	01 76	0075 004B	C1	4B	41	2E
01 15	01 15	0014 000E	40	4E	20	2B	02 37	01 77	0076 004C	C1	4C	41	3C
01 16	01 16	0015 000F	40	4F	20	21	02 38	01 78	0077 004D	C1	4D	41	28
01 17	01 17	0016 0010	40	50	20	26	02 39	01 79	0078 004E	C1	4E	41	2B
01 18	01 18	0017 0011	40	D1	20	4A	02 40	01 80	0079 004F	C1	4F	41	21
01 19	01 19	0018 0012	40	D2	20	4B	03 01	02 01	0080 0050	C1	50	41	26
01 20	01 20	0019 0013	40	D3	20	4C	03 02	02 02	0081 0051	C1	D1	41	4A
01 21	01 21	0020 0014	40	D4	20	4D	03 03	02 03	0082 0052	C1	D2	41	4B
01 22	01 22	0021 0015	40	D5	20	4E	03 04	02 04	0083 0053	C1	D3	41	4C
01 23	01 23	0022 0016	40	D6	20	4F	03 05	02 05	0084 0054	C1	D4	41	4D
01 24	01 24	0023 0017	40	D7	20	50	03 06	02 06	0085 0055	C1	D5	41	4E
01 25	01 25	0024 0018	40	D8	20	51	03 07	02 07	0086 0056	C1	D6	41	4F
01 26	01 26	0025 0019	40	D9	20	52	03 08	02 08	0087 0057	C1	D7	41	50
01 27	01 27	0026 001A	40	5A	20	5D	03 09	02 09	0088 0058	C1	D8	41	51
01 28	01 28	0027 001B	40	5B	20	24	03 10	02 10	0089 0059	C1	D9	41	52
01 29	01 29	0028 001C	40	5C	20	2A	03 11	02 11	0090 005A	C1	5A	41	5D
01 30	01 30	0029 001D	40	5D	20	29	03 12	02 12	0091 005B	C1	5B	41	24
01 31	01 31	0030 001E	40	5E	20	3B	03 13	02 13	0092 005C	C1	5C	41	2A
01 32	01 32	0030 001F	40	5F	20	5E	03 14	02 14	0093 005D	C1	5D	41	29
01 33	01 33	0032 0020	40	60	20	2D	03 15	02 15	0094 005E	C1	5E	41	3B
01 34	01 34	0033 0021	40	61	20	2F	03 16	02 16	0095 005F	C1	5F	41	5E
01 35	01 35	0034 0022	40	E2	20	53	03 17	02 17	0096 0060	C1	60	41	2D
01 36	01 36	0035 0023	40	E3	20	54	03 18	02 18	0097 0061	C1	61	41	2F
01 37	01 37	0036 0024	40	E4	20	55	03 19	02 19	0098 0062	C1	E2	41	53
01 38	01 38	0037 0025	40	E5	20	56	03 20	02 20	0099 0063	C1	E3	41	54
01 39	01 39	0038 0026	40	E6	20	57	03 21	02 21	0100 0064	C1	E4	41	55
01 40	01 40	0039 0027	40	E7	20	58	03 22	02 22	0101 0065	C1	E5	41	56
02 01	01 41	0040 0028	40	E8	20	59	03 23	02 23	0102 0066	C1	E6	41	57
02 02	01 42	0041 0029	40	E9	20	5A	03 24	02 24	0103 0067	C1	E7	41	58
02 03	01 43	0042 002A	40	6A	20	7C	03 25	02 25	0104 0068	C1	E8	41	59
02 04	01 44	0043 002B	40	6B	20	2C	03 26	02 26	0105 0069	C1	E9	41	5A
02 05	01 45	0044 002C	40	6C	20	25	03 27	02 27	0106 006A	C1	6A	41	7C
02 06	01 46	0045 002D	40	6D	20	5F	03 28	02 28	0107 006B	C1	6B	41	2C
02 07	01 47	0046 002E	40	6E	20	3E	03 29	02 29	0108 006C	C1	6C	41	25
02 08	01 48	0047 002F	40	6F	20	3F	03 30	02 30	0109 006D	C1	6D	41	5F
02 09	01 49	0048 0030	40	F0	20	30	03 31	02 31	0110 006E	C1	6E	41	3E
02 10	01 50	0049 0031	40	F1	20	31	03 32	02 32	0111 006F	C1	6F	41	3F
02 11	01 51	0050 0032	40	F2	20	32	03 33	02 33	0112 0070	C1	F0	41	30
02 12	01 52	0051 0033	40	F3	20	33	03 34	02 34	0113 0071	C1	F1	41	31
02 13	01 53	0052 0034	40	F4	20	34	03 35	02 35	0114 0072	C1	F2	41	32
02 14	01 54	0053 0035	40	F5	20	35	03 36	02 36	0115 0073	C1	F3	41	33
02 15	01 55	0054 0036	40	F6	20	36	03 37	02 37	0116 0074	C1	F4	41	34
02 16	01 56	0055 0037	40	F7	20	37	03 38	02 38	0117 0075	C1	F5	41	35
02 17	01 57	0056 0038	40	F8	20	38	03 39	02 39	0118 0076	C1	F6	41	36
02 18	01 58	0057 0039	40	F9	20	39	03 40	02 40	0119 0077	C1	F7	41	37
02 19	01 59	0058 003A	40	7A	20	3A	04 01	02 41	0120 0078	C1	F8	41	38
02 20	01 60	0059 003B	40	7B	20	23	04 02	02 42	0121 0079	C1	F9	41	39
02 21	01 61	0060 003C	40	7C	20	40	04 03	02 43	0122 007A	C1	7A	41	3A
02 22	01 62	0061 003D	40	7D	20	27	04 04	02 44	0123 007B	C1	7B	41	23

Mod 1 R C	Mods 2,3,4 R C	Position Dec Hex	EBCDIC		ASCII	
04 05	02 45	0124 007C	C1	7C	41	40
04 06	02 46	0125 007D	C1	7D	41	27
04 07	02 47	0126 007E	C1	7E	41	3D
04 08	02 48	0127 007F	C1	7F	41	22
04 09	02 49	0128 0080	C2	40	42	20
04 10	02 50	0129 0081	C2	C1	42	41
04 11	02 51	0130 0082	C2	C2	42	42
04 12	02 52	0131 0083	C2	C3	42	43
04 13	02 53	0132 0084	C2	C4	42	44
04 14	02 54	0133 0085	C2	C5	42	45
04 15	02 55	0134 0086	C2	C6	42	46
04 16	02 56	0135 0087	C2	C7	42	47
04 17	02 57	0136 0088	C2	C8	42	48
04 18	02 58	0137 0089	C2	C9	42	49
04 19	02 59	0138 008A	C2	4A	42	5B
04 20	02 60	0139 008B	C2	4B	42	2E
04 21	02 61	0140 008C	C2	4C	42	3C
04 22	02 62	0141 008D	C2	4D	42	28
04 23	02 63	0142 008E	C2	4E	42	2B
04 24	02 64	0143 008F	C2	4F	42	21
04 25	02 65	0144 0090	C2	50	42	26
04 26	02 66	0145 0091	C2	D1	42	4A
04 27	02 67	0146 0092	C2	D2	42	4B
04 28	02 68	0147 0093	C2	D3	42	4C
04 29	02 69	0148 0094	C2	D4	42	4D
04 30	02 70	0149 0095	C2	D5	42	4E
04 31	02 71	0150 0096	C2	D6	42	4F
04 32	02 72	0151 0097	C2	D7	42	50
04 33	02 73	0152 0098	C2	D8	42	51
04 34	02 74	0153 0099	C2	D9	42	52
04 35	02 75	0154 009A	C2	5A	42	5D
04 36	02 76	0155 009B	C2	5B	42	24
04 37	02 77	0156 009C	C2	5C	42	2A
04 38	02 78	0157 009D	C2	5D	42	29
04 39	02 79	0158 009E	C2	5E	42	3B
04 40	02 80	0159 009F	C2	5F	42	5E
05 01	03 01	0160 00A0	C2	60	42	2D
05 02	03 02	0161 00A1	C2	61	42	2F
05 03	03 03	0162 00A2	C2	E2	42	53
05 04	03 04	0163 00A3	C2	E3	42	54
05 05	03 05	0164 00A4	C2	E4	42	55
05 06	03 06	0165 00A5	C2	E5	42	56
05 07	03 07	0166 00A6	C2	E6	42	57
05 08	03 08	0167 00A7	C2	E7	42	58
05 09	03 09	0168 00A8	C2	E8	42	59
05 10	03 10	0169 00A9	C2	E9	42	5A
05 11	03 11	0170 00AA	C2	6A	42	7C
05 12	03 12	0171 00AB	C2	6B	42	2C
05 13	03 13	0172 00AC	C2	6C	42	25
05 14	03 14	0173 00AD	C2	6D	42	5F
05 15	03 15	0174 00AE	C2	6E	42	3E
05 16	03 16	0175 00AF	C2	6F	42	3F
05 17	03 17	0176 00B0	C2	F0	42	30
05 18	03 18	0177 00B1	C2	F1	42	31
05 19	03 19	0178 00B2	C2	F2	42	32
05 20	03 20	0179 00B3	C2	F3	42	33
05 21	03 21	0180 00B4	C2	F4	42	34
05 22	03 22	0181 00B5	C2	F5	42	35
05 23	03 23	0182 00B6	C2	F6	42	36
05 24	03 24	0183 00B7	C2	F7	42	37
05 25	03 25	0184 00B8	C2	F8	42	38
05 26	03 26	0185 00B9	C2	F9	42	39

Mod 1 R C	Mods 2,3,4 R C	Position Dec Hex	EBCDIC		ASCII	
05 27	03 27	0186 00BA	C2	7A	42	3A
05 28	03 28	0187 00BB	C2	7B	42	23
05 29	03 29	0188 00BC	C2	7C	42	40
05 30	03 30	0189 00BD	C2	7D	42	27
05 31	03 31	0190 00BE	C2	7E	42	3D
05 32	03 32	0191 00BF	C2	7F	42	22
05 33	03 33	0192 00C0	C3	40	43	20
05 34	03 34	0193 00C1	C3	C1	43	41
05 35	03 35	0194 00C2	C3	C2	43	42
05 36	03 36	0195 00C3	C3	C3	43	43
05 37	03 37	0196 00C4	C3	C4	43	44
05 38	03 38	0197 00C5	C3	C5	43	45
05 39	03 39	0198 00C6	C3	C6	43	46
05 40	03 40	0199 00C7	C3	C7	43	47
06 01	03 41	0200 00C8	C3	C8	43	48
06 02	03 42	0201 00C9	C3	C9	43	49
06 03	03 43	0202 00CA	C3	4A	43	5B
06 04	03 44	0203 00CB	C3	4B	43	2F
06 05	03 45	0204 00CC	C3	4C	43	3C
06 06	03 46	0205 00CD	C3	4D	43	28
06 07	03 47	0206 00CE	C3	4E	43	2B
06 08	03 48	0207 00CF	C3	4F	43	21
06 09	03 49	0208 00D0	C3	50	43	26
06 10	03 50	0209 00D1	C3	D1	43	4A
06 11	03 51	0210 00D2	C3	D2	43	4B
06 12	03 52	0211 00D3	C3	D3	43	4C
06 13	03 53	0212 00D4	C3	D4	43	4D
06 14	03 54	0213 00D5	C3	D5	43	4E
06 15	03 55	0214 00D6	C3	D6	43	4F
06 16	03 56	0215 00D7	C3	D7	43	50
06 17	03 57	0216 00D8	C3	D8	43	51
06 18	03 58	0217 00D9	C3	D9	43	52
06 19	03 59	0218 00DA	C3	5A	43	5D
06 20	03 60	0219 00DB	C3	5B	43	24
06 21	03 61	0220 00DC	C3	5C	43	2A
06 22	03 62	0221 00DD	C3	5D	43	29
06 23	03 63	0222 00DE	C3	5E	43	3B
06 24	03 64	0223 00DF	C3	5F	43	5E
06 25	03 65	0224 00E0	C3	60	43	2D
06 26	03 66	0225 00E1	C3	61	43	2F
06 27	03 67	0226 00E2	C3	E2	43	53
06 28	03 68	0227 00E3	C3	E3	43	54
06 29	03 69	0228 00E4	C3	E4	43	55
06 30	03 70	0229 00E5	C3	E5	43	56
06 31	03 71	0230 00E6	C3	E6	43	57
06 32	03 72	0231 00E7	C3	E7	43	58
06 33	03 73	0232 00E8	C3	E8	43	59
06 34	03 74	0233 00E9	C3	E9	43	5A
06 35	03 75	0234 00EA	C3	6A	43	7C
06 36	03 76	0235 00EB	C3	6B	43	2C
06 37	03 77	0236 00EC	C3	6C	43	25
06 38	03 78	0237 00ED	C3	6D	43	5F
06 39	03 79	0238 00EE	C3	6E	43	3E
06 40	03 80	0239 00EF	C3	6F	43	3F
07 01	04 01	0240 00F0	C3	F0	43	30
07 02	04 02	0241 00F1	C3	F1	43	31
07 03	04 03	0242 00F2	C3	F2	43	32
07 04	04 04	0243 00F3	C3	F3	43	33
07 05	04 05	0244 00F4	C3	F4	43	34
07 06	04 06	0245 00F5	C3	F5	43	35
07 07	04 07	0246 00F6	C3	F6	43	36
07 08	04 08	0247 00F7	C3	F7	43	37

Mod 1 R C	Mods 2,3,4 R C	Position Dec Hex	Buffer Address (Hex) EBCDIC	ASCII
07 09	04 09	0248 00F8	C3 F8	43 38
07 10	04 10	0249 00F9	C3 F9	43 39
07 11	04 11	0250 00FA	C3 7A	43 3A
07 12	04 12	0251 00FB	C3 7B	43 23
07 13	04 13	0252 00FC	C3 7C	43 40
07 14	04 14	0253 00FD	C3 7D	43 27
07 15	04 15	0254 00FE	C3 7E	43 3D
07 16	04 16	0255 00FF	C3 7F	43 22
07 17	04 17	0256 0100	C4 40	44 20
07 18	04 18	0257 0101	C4 C1	44 41
07 19	04 19	0258 0102	C4 C2	44 42
07 20	04 20	0259 0103	C4 C3	44 43
07 21	04 21	0260 0104	C4 C4	44 44
07 22	04 22	0261 0105	C4 C5	44 45
07 23	04 23	0262 0106	C4 C6	44 46
07 24	04 24	0263 0107	C4 C7	44 47
07 25	04 25	0264 0108	C4 C8	44 48
07 26	04 26	0265 0109	C4 C9	44 49
07 27	04 27	0266 010A	C4 4A	44 5B
07 28	04 28	0267 010B	C4 4B	44 2E
07 29	04 29	0268 010C	C4 4C	44 3C
07 30	04 30	0269 010D	C4 4D	44 28
07 31	04 31	0270 010E	C4 4E	44 2B
07 32	04 32	0271 010F	C4 4F	44 21
07 33	04 33	0272 0110	C4 50	44 26
07 34	04 34	0273 0111	C4 D1	44 4A
07 35	04 35	0274 0112	C4 D2	44 4B
07 36	04 36	0275 0113	C4 D3	44 4C
07 37	04 37	0276 0114	C4 D4	44 4D
07 38	04 38	0277 0115	C4 D5	44 4E
07 39	04 39	0278 0116	C4 D6	44 4F
07 40	04 40	0279 0117	C4 D7	44 50
08 01	04 41	0280 0118	C4 D8	44 51
08 02	04 42	0281 0119	C4 D9	44 52
08 03	04 43	0282 011A	C4 5A	44 5D
08 04	04 44	0283 011B	C4 5B	44 24
08 05	04 45	0284 011C	C4 5C	44 2A
08 06	04 46	0285 011D	C4 5D	44 29
08 07	04 47	0286 011E	C4 5E	44 3B
08 08	04 48	0287 011F	C4 5F	44 5E
08 09	04 49	0288 0120	C4 60	44 2D
08 10	04 50	0289 0121	C4 61	44 2F
08 11	04 51	0290 0122	C4 E2	44 53
08 12	04 52	0291 0123	C4 E3	44 54
08 13	04 53	0292 0124	C4 E4	44 55
08 14	04 54	0293 0125	C4 E5	44 56
08 15	04 55	0294 0126	C4 E6	44 57
08 16	04 56	0295 0127	C4 E7	44 58
08 17	04 57	0296 0128	C4 E8	44 59
08 18	04 58	0297 0129	C4 E9	44 5A
08 19	04 59	0298 012A	C4 6A	44 7C
08 20	04 60	0299 012B	C4 6B	44 2C
08 21	04 61	0300 012C	C4 6C	44 25
08 22	04 62	0301 012D	C4 6D	44 5F
08 23	04 63	0302 012E	C4 6E	44 3E
08 24	04 64	0303 012F	C4 6F	44 3F
08 25	04 65	0304 0130	C4 F0	44 30
08 26	04 66	0305 0131	C4 F1	44 31
08 27	04 67	0306 0132	C4 F2	44 32
08 28	04 68	0307 0133	C4 F3	44 33
08 29	04 69	0308 0134	C4 F4	44 34
08 30	04 70	0309 0135	C4 F5	44 35
08 31	04 71	0310 0136	C4 F6	44 36
08 32	04 72	0311 0137	C4 F7	44 37
08 33	04 73	0312 0138	C4 F8	44 38
08 34	04 74	0313 0139	C4 F9	44 39
08 35	04 75	0314 013A	C4 7A	44 3A
08 36	04 76	0315 013B	C4 7B	44 23
08 37	04 77	0316 013C	C4 7C	44 40
08 38	04 78	0317 013D	C4 7D	44 27
08 39	04 79	0318 013E	C4 7E	44 3D
08 40	04 80	0319 013F	C4 7F	44 22
09 01	05 01	0320 0140	C5 40	45 20
09 02	05 02	0321 0141	C5 C1	45 41
09 03	05 03	0322 0142	C5 C2	45 42
09 04	05 04	0323 0143	C5 C3	45 43
09 05	05 05	0324 0144	C5 C4	45 44
09 06	05 06	0325 0145	C5 C5	45 45
09 07	05 07	0326 0146	C5 C6	45 46
09 08	05 08	0327 0147	C5 C7	45 47
09 09	05 09	0328 0148	C5 C8	45 48
09 10	05 10	0329 0149	C5 C9	45 49
09 11	05 11	0330 014A	C5 4A	45 5B
09 12	05 12	0331 014B	C5 4B	45 2E
09 13	05 13	0332 014C	C5 4C	45 3C
09 14	05 14	0333 014D	C5 4D	45 28
09 15	05 15	0334 014E	C5 4E	45 2B
09 16	05 16	0335 014F	C5 4F	45 21
09 17	05 17	0336 0150	C5 50	45 26
09 18	05 18	0337 0151	C5 D1	45 4A
09 19	05 19	0338 0152	C5 D2	45 4B
09 20	05 20	0339 0153	C5 D3	45 4C
09 21	05 21	0340 0154	C5 D4	45 4D
09 22	05 22	0341 0155	C5 D5	45 4E
09 23	05 23	0342 0156	C5 D6	45 4F
09 24	05 24	0343 0157	C5 D7	45 50
09 25	05 25	0344 0158	C5 D8	45 51
09 26	05 26	0345 0159	C5 D9	45 52
09 27	05 27	0346 015A	C5 5A	45 5D
09 28	05 28	0347 015B	C5 5B	45 24
09 29	05 29	0348 015C	C5 5C	45 2A
09 30	05 30	0349 015D	C5 5D	45 29
09 31	05 31	0350 015E	C5 5E	45 3B
09 32	05 32	0351 015F	C5 5F	45 5E
09 33	05 33	0352 0160	C5 60	45 2D
09 34	05 34	0353 0161	C5 61	45 2F
09 35	05 35	0354 0162	C5 E2	45 53
09 36	05 36	0355 0163	C5 E3	45 54
09 37	05 37	0356 0164	C5 E4	45 55
09 38	05 38	0357 0165	C5 E5	45 56
09 39	05 39	0358 0166	C5 E6	45 57
09 40	05 40	0359 0167	C5 E7	45 58
10 01	05 41	0360 0168	C5 E8	45 59
10 02	05 42	0361 0169	C5 E9	45 5A
10 03	05 43	0362 016A	C5 6A	45 7C
10 04	05 44	0363 016B	C5 6B	45 2C
10 05	05 45	0364 016C	C5 6C	45 25
10 06	05 46	0365 016D	C5 6D	45 5F
10 07	05 47	0366 016E	C5 6E	45 3E
10 08	05 48	0367 016F	C5 6F	45 3F
10 09	05 49	0368 0170	C5 F0	45 30
10 10	05 50	0369 0171	C5 F1	45 31
10 11	05 51	0370 0172	C5 F2	45 32
10 12	05 52	0371 0173	C5 F3	45 33

Mod 1 R C	Mods 2,3,4 R C	Position Dec	Hex	EBCDIC		ASCII	
10 13	05 53	0372	0174	C5	F4	45	34
10 14	05 54	0373	0175	C5	F5	45	35
10 15	05 55	0374	0176	C5	F6	45	36
10 16	05 56	0375	0177	C5	F7	45	37
10 17	05 57	0376	0178	C5	F8	45	38
10 18	05 58	0377	0179	C5	F9	45	39
10 19	05 59	0378	017A	C5	7A	45	3A
10 20	05 60	0379	017B	C5	7B	45	23
10 21	05 61	0380	017C	C5	7C	45	40
10 22	05 62	0381	017D	C5	7D	45	27
10 23	05 63	0382	017E	C5	7E	45	3D
10 24	05 64	0383	017F	C5	7F	45	22
10 25	05 65	0384	0180	C6	40	46	20
10 26	05 66	0385	0181	C6	C1	46	41
10 27	05 67	0386	0182	C6	C2	46	42
10 28	05 68	0387	0183	C6	C3	46	43
10 29	05 69	0388	0184	C6	C4	46	44
10 30	05 70	0389	0185	C6	C5	46	45
10 31	05 71	0390	0186	C6	C6	46	46
10 32	05 72	0391	01B7	C6	C7	46	47
10 33	05 73	0392	0188	C6	C8	46	48
10 34	05 74	0393	0189	C6	C9	46	49
10 35	05 75	0394	018A	C6	4A	46	5B
10 36	05 76	0395	018B	C6	4B	46	2E
10 37	05 77	0396	018C	C6	4C	46	3C
10 38	05 78	0397	018D	C6	4D	46	28
10 39	05 79	0398	018E	C6	4E	46	2B
10 40	05 80	0399	018F	C6	4F	46	21
11 01	06 01	0400	0190	C6	50	46	26
11 02	06 02	0401	0191	C6	D1	46	4A
11 03	06 03	0402	0192	C6	D2	46	4B
11 04	06 04	0403	0193	C6	D3	46	4C
11 05	06 05	0404	0194	C6	D4	46	4D
11 06	06 06	0405	0195	C6	D5	46	4E
11 07	06 07	0406	0196	C6	D6	46	4F
11 08	06 08	0407	0197	C6	D7	46	50
11 09	06 09	0408	0198	C6	D8	46	51
11 10	06 10	0409	0199	C6	D9	46	52
11 11	06 11	0410	019A	C6	5A	46	5D
11 12	06 12	0411	019B	C6	5B	46	24
11 13	06 13	0412	019C	C6	5C	46	2A
11 14	06 14	0413	019D	C6	5D	46	29
11 15	06 15	0414	019E	C6	5E	46	3B
11 16	06 16	0415	019F	C6	5F	46	5E
11 17	06 17	0416	01A0	C6	60	46	2D
11 18	06 18	0417	01A1	C6	61	46	2F
11 19	06 19	0418	01A2	C6	E2	46	53
11 20	06 20	0419	01A3	C6	E3	46	54
11 21	06 21	0420	01A4	C6	E4	46	55
11 22	06 22	0421	01A5	C6	E5	46	56
11 23	06 23	0422	01A6	C6	E6	46	57
11 24	06 24	0423	01A7	C6	E7	46	58
11 25	06 25	0424	01A8	C6	E8	46	59
11 26	06 26	0425	01A9	C6	E9	46	5A
11 27	06 27	0426	01AA	C6	6A	46	7C
11 28	06 28	0427	01AB	C6	6B	46	2C
11 29	06 29	0428	01AC	C6	6C	46	25
11 30	06 30	0429	01AD	C6	6D	46	5F
11 31	06 31	0430	01AE	C6	6E	46	3E
11 32	06 32	0431	01AF	C6	6F	46	3F
11 33	06 33	0432	01B0	C6	F0	46	30
11 34	06 34	0433	01B1	C6	F1	46	31

Mod 1 R C	Mods 2,3,4 R C	Position Dec	Hex	EBCDIC		ASCII	
11 35	06 35	0434	01B2	C6	F2	46	32
11 36	06 36	0435	01B3	C6	F3	46	33
11 37	06 37	0436	01B4	C6	F4	46	34
11 38	06 38	0437	01B5	C6	F5	46	35
11 39	06 39	0438	01B6	C6	F6	46	36
11 40	06 40	0439	01B7	C6	F7	46	37
12 01	06 41	0440	01B8	C6	F8	46	38
12 02	06 42	0441	01B9	C6	F9	46	39
12 03	06 43	0442	01BA	C6	7A	46	3A
12 04	06 44	0443	01BB	C6	7B	46	23
12 05	06 45	0444	01BC	C6	7C	46	40
12 06	06 46	0445	01BD	C6	7D	46	27
12 07	06 47	0446	01BE	C6	7E	46	3D
12 08	06 48	0447	01BF	C6	7F	46	22
12 09	06 49	0448	01C0	C7	40	47	20
12 10	06 50	0449	01C1	C7	C1	47	41
12 11	06 51	0450	01C2	C7	C2	47	42
12 12	06 52	0451	01C3	C7	C3	47	43
12 13	06 53	0452	01C4	C7	C4	47	44
12 14	06 54	0453	01C5	C7	C5	47	45
12 15	06 55	0454	01C6	C7	C6	47	46
12 16	06 56	0455	01C7	C7	C7	47	47
12 17	06 57	0456	01C8	C7	C8	47	48
12 18	06 58	0457	01C9	C7	C9	47	49
12 19	06 59	0458	01CA	C7	4A	47	5B
12 20	06 60	0459	01CB	C7	4B	47	2E
12 21	06 61	0460	01CC	C7	4C	47	3C
12 22	06 62	0461	01CD	C7	4D	47	28
12 23	06 63	0462	01CE	C7	4E	47	2B
12 24	06 64	0463	01CF	C7	4F	47	21
12 25	06 65	0464	01D0	C7	50	47	26
12 26	06 66	0465	01D1	C7	D1	47	4A
12 27	06 67	0466	01D2	C7	D2	47	4B
12 28	06 68	0467	01D3	C7	D3	47	4C
12 29	06 69	0468	01D4	C7	D4	47	4D
12 30	06 70	0469	01D5	C7	D5	47	4E
12 31	06 71	0470	01D6	C7	D6	47	4F
12 32	06 72	0471	01D7	C7	D7	47	50
12 33	06 73	0472	01D8	C7	D8	47	51
12 34	06 74	0473	01D9	C7	D9	47	52
12 35	06 75	0474	01DA	C7	5A	47	5D
12 36	06 76	0475	01DB	C7	5B	47	24
12 37	06 77	0476	01DC	C7	5C	47	2A
12 38	06 78	0477	01DD	C7	5D	47	29
12 39	06 79	0478	01DE	C7	5E	47	3B
12 40	06 80	0479	01DF	C7	5F	47	5E
	07 01	0480	01E0	C7	60	47	2D
	07 02	0481	01E1	C7	61	47	2F
	07 03	0482	01E2	C7	E2	47	53
	07 04	0483	01E3	C7	E3	47	54
	07 05	0484	01E4	C7	E4	47	55
	07 06	0485	01E5	C7	E5	47	56
	07 07	0486	01E6	C7	E6	47	57
	07 08	0487	01E7	C7	E7	47	58
	07 09	0488	01E8	C7	E8	47	59
	07 10	0489	01E9	C7	E9	47	5A
	07 11	0490	01EA	C7	6A	47	7C
	07 12	0491	01EB	C7	6B	47	2C
	07 13	0492	01EC	C7	6C	47	25
	07 14	0493	01ED	C7	6D	47	5F
	07 15	0494	01EE	C7	6E	47	3E
	07 16	0495	01EF	C7	6F	47	3F

Mod 1 R C	Mods 2,3,4 R C	Position Dec	Hex	EBCDIC		ASCII	
	07 17	0496	01F0	C7	F0	47	30
	07 18	0497	01F1	C7	F1	47	31
	07 19	0498	01F2	C7	F2	47	32
	07 20	0499	01F3	C7	F3	47	33
	07 21	0500	01F4	C7	F4	47	34
	07 22	0501	01F5	C7	F5	47	35
	07 23	0502	01F6	C7	F6	47	36
	07 24	0503	01F7	C7	F7	47	37
	07 25	0504	01F8	C7	F8	47	38
	07 26	0505	01F9	C7	F9	47	39
	07 27	0506	01FA	C7	7A	47	3A
	07 28	0507	01FB	C7	7B	47	23
	07 29	0508	01FC	C7	7C	47	40
	07 30	0509	01FD	C7	7D	47	27
	07 31	0510	01FE	C7	7E	47	3D
	07 32	0511	01FF	C7	7F	47	22
	07 33	0512	0200	C8	40	48	20
	07 34	0513	0201	C8	C1	48	41
	07 35	0514	0202	C8	C2	48	42
	07 36	0515	0203	C8	C3	48	43
	07 37	0516	0204	C8	C4	48	44
	07 38	0517	0205	C8	C5	48	45
	07 39	0518	0206	C8	C6	48	46
	07 40	0519	0207	C8	C7	48	47
	07 41	0520	0208	C8	C8	48	48
	07 42	0521	0209	C8	C9	48	49
	07 43	0522	020A	C8	4A	48	5B
	07 44	0523	020B	C8	4B	48	2E
	07 45	0524	020C	C8	4C	48	3C
	07 46	0525	020D	C8	4D	48	28
	07 47	0526	020E	C8	4E	48	2B
	07 48	0527	020F	C8	4F	48	21
	07 49	0528	0210	C8	50	48	26
	07 50	0529	0211	C8	D1	48	4A
	07 51	0530	0212	C8	D2	48	4B
	07 52	0531	0213	C8	D3	48	4C
	07 53	0532	0214	C8	D4	48	4D
	07 54	0533	0215	C8	D5	48	4E
	07 55	0534	0216	C8	D6	48	4F
	07 56	0535	0217	C8	D7	48	50
	07 57	0536	0218	C8	D8	48	51
	07 58	0537	0219	C8	D9	48	52
	07 59	0538	021A	C8	5A	48	5D
	07 60	0539	021B	C8	5B	48	24
	07 61	0540	021C	C8	5C	48	2A
	07 62	0541	021D	C8	5D	48	29
	07 63	0542	021E	C8	5E	48	3B
	07 64	0543	021F	C8	5F	48	5E
	07 65	0544	0220	C8	60	48	2D
	07 66	0545	0221	C8	61	48	2F
	07 67	0546	0222	C8	E2	48	53
	07 68	0547	0223	C8	E3	48	54
	07 69	0548	0224	C8	E4	48	55
	07 70	0549	0225	C8	E5	48	56
	07 71	0550	0226	C8	E6	48	57
	07 72	0551	0227	C8	E7	48	58
	07 73	0552	0228	C8	E8	48	59
	07 74	0553	0229	C8	E9	48	5A
	07 75	0554	022A	C8	6A	48	7C
	07 76	0555	022B	C8	6B	48	2C
	07 77	0556	022C	C8	6C	48	25
	07 78	0557	022D	C8	6D	48	5F

Mod 1 R C	Mods 2,3,4 R C	Position Dec	Hex	EBCDIC		ASCII	
	07 79	0558	022E	C8	6E	48	3E
	07 80	0559	022F	C8	6F	48	3F
	08 01	0560	0230	C8	F0	48	30
	08 02	0561	0231	C8	F1	48	31
	08 03	0562	0232	C8	F2	48	32
	08 04	0563	0233	C8	F3	48	33
	08 05	0564	0234	C8	F4	48	34
	08 06	0565	0235	C8	F5	48	35
	08 07	0566	0236	C8	F6	48	36
	08 08	0567	0237	C8	F7	48	37
	08 09	0568	0238	C8	F8	48	38
	08 10	0569	0239	C8	F9	48	39
	08 11	0570	023A	C8	7A	48	3A
	08 12	0571	023B	C8	7B	48	23
	08 13	0572	023C	C8	7C	48	40
	08 14	0573	023D	C8	7D	48	27
	08 15	0574	023E	C8	7E	48	3D
	08 16	0575	023F	C8	7F	48	22
	08 17	0576	0240	C9	40	49	20
	08 18	0577	0241	C9	C1	49	41
	08 19	0578	0242	C9	C2	49	42
	08 20	0579	0243	C9	C3	49	43
	08 21	0580	0244	C9	C4	49	44
	08 22	0581	0245	C9	C5	49	45
	08 23	0582	0246	C9	C6	49	46
	08 24	0583	0247	C9	C7	49	47
	08 25	0584	0248	C9	C8	49	48
	08 26	0585	0249	C9	C9	49	49
	08 27	0586	024A	C9	4A	49	5B
	08 28	0587	024B	C9	4B	49	2E
	08 29	0588	024C	C9	4C	49	3C
	08 30	0589	024D	C9	4D	49	28
	08 31	0590	024E	C9	4E	49	2B
	08 32	0591	024F	C9	4F	49	21
	08 33	0592	0250	C9	50	59	26
	08 34	0593	0251	C9	D1	49	4A
	08 35	0594	0252	C9	D2	49	4B
	08 36	0595	0253	C9	D3	49	4C
	08 37	0596	0254	C9	D4	49	4D
	08 38	0597	0255	C9	D5	49	4E
	08 39	0598	0256	C9	D6	49	4F
	08 40	0599	0257	C9	D7	49	50
	08 41	0600	0258	C9	D8	49	51
	08 42	0601	0259	C9	D9	49	52
	08 43	0602	025A	C9	5A	49	5D
	08 44	0603	025B	C9	5B	49	24
	08 45	0604	025C	C9	5C	49	2A
	08 46	0605	025D	C9	5D	49	29
	08 47	0606	025E	C9	5E	49	3B
	08 48	0607	025F	C9	5F	49	5E
	08 49	0608	0260	C9	60	49	2D
	08 50	0609	0261	C9	61	49	2F
	08 51	0610	0262	C9	E2	49	53
	08 52	0611	0263	C9	E3	49	54
	08 53	0612	0264	C9	E4	49	55
	08 54	0613	0265	C9	E5	49	56
	08 55	0614	0266	C9	E6	49	57
	08 56	0615	0267	C9	E7	49	58
	08 57	0616	0268	C9	E8	49	59
	08 58	0617	0269	C9	E9	49	5A
	08 59	0618	026A	C9	6A	49	7C
	08 60	0619	026B	C9	6B	49	2C

Mod 1 R C	Mods 2,3,4 R C	Position Dec	Hex	EBCDIC		ASCII	
	08 61	0620	026C	C9	6C	49	25
	08 62	0621	026D	C9	6D	49	5F
	08 63	0622	026E	C9	6E	49	3E
	08 64	0623	026F	C9	6F	49	3F
	08 65	0624	0270	C9	F0	49	30
	08 66	0625	0271	C9	F1	49	31
	08 67	0626	0272	C9	F2	49	32
	08 68	0627	0273	C9	F3	49	33
	08 69	0628	0274	C9	F4	49	34
	08 70	0629	0275	C9	F5	49	35
	08 71	0630	0276	C9	F6	49	36
	08 72	0631	0277	C9	F7	49	37
	08 73	0632	0278	C9	F8	49	38
	08 74	0633	0279	C9	F9	49	39
	08 75	0634	027A	C9	7A	49	3A
	08 76	0635	027B	C9	7B	49	23
	08 77	0636	027C	C9	7C	49	40
	08 78	0637	027D	C9	7D	49	27
	08 79	0638	027E	C9	7E	49	3D
	08 80	0639	027F	C9	7F	49	22
	09 01	0640	0280	4A	40	5B	20
	09 02	0641	0281	4A	C1	5B	41
	09 03	0642	0282	4A	C2	5B	42
	09 04	0643	0283	4A	C3	5B	43
	09 05	0644	0284	4A	C4	5B	44
	09 06	0645	0285	4A	C5	5B	45
	09 07	0646	0286	4A	C6	5B	46
	09 08	0647	0287	4A	C7	5B	47
	09 09	0648	0288	4A	C8	5B	48
	09 10	0649	0289	4A	C9	5B	49
	09 11	0650	028A	4A	4A	5B	5B
	09 12	0651	028B	4A	4B	5B	2E
	09 13	0652	028C	4A	4C	5B	3C
	09 14	0653	028D	4A	4D	5B	28
	09 15	0654	028E	4A	4E	5B	2B
	09 16	0655	028F	4A	4F	5B	21
	09 17	0656	0290	4A	40	5B	26
	09 18	0657	0291	4A	D1	5B	4A
	09 19	0658	0292	4A	D2	5B	4B
	09 20	0659	0293	4A	D3	5B	4C
	09 21	0660	0294	4A	D4	5B	4D
	09 22	0661	0295	4A	D5	5B	4E
	09 23	0662	0296	4A	D6	5B	4F
	09 24	0663	0297	4A	D7	5B	50
	09 25	0664	0298	4A	D8	5B	51
	09 26	0665	0299	4A	D9	5B	52
	09 27	0666	029A	4A	5A	5B	5D
	09 28	0667	029B	4A	5B	5B	24
	09 29	0668	029C	4A	5C	5B	2A
	09 30	0669	029D	4A	5D	5B	29
	09 31	0670	029E	4A	5E	5B	3B
	09 32	0671	029F	4A	5F	5B	5E
	09 33	0672	02A0	4A	60	5B	2D
	09 34	0673	02A1	4A	61	5B	2F
	09 35	0674	02A2	4A	E2	5B	53
	09 36	0675	02A3	4A	E3	5B	54
	09 37	0676	02A4	4A	E4	5B	55
	09 38	0677	02A5	4A	E5	5B	56
	09 39	0678	02A6	4A	E6	5B	57
	09 40	0679	02A7	4A	E7	5B	58
	09 41	0680	02A8	4A	E8	5B	59
	09 42	0681	02A9	4A	E9	5B	5A

Mod 1 R C	Mods 2,3,4 R C	Position Dec	Hex	EBCDIC		ASCII	
	09 43	0682	02AA	4A	6A	5B	7C
	09 44	0683	02AB	4A	6B	5B	2C
	09 45	0684	02AC	4A	6C	5B	25
	09 46	0685	02AD	4A	6D	5B	5F
	09 47	0686	02AE	4A	6E	5B	3E
	09 48	0687	02AF	4A	6F	5B	3F
	09 49	0688	02B0	4A	F0	5B	30
	09 50	0689	02B1	4A	F1	5B	31
	09 51	0690	02B2	4A	F2	5B	32
	09 52	0691	02B3	4A	F3	5B	33
	09 53	0692	02B4	4A	F4	5B	34
	09 54	0693	02B5	4A	F5	5B	35
	09 55	0694	02B6	4A	F6	5B	36
	09 56	0695	02B7	4A	F7	5B	37
	09 57	0696	02B8	4A	F8	5B	38
	09 58	0697	02B9	4A	F9	5B	39
	09 59	0698	02BA	4A	7A	5B	3A
	09 60	0699	02BB	4A	7B	5B	23
	09 61	0700	02BC	4A	7C	5B	40
	09 62	0701	02BD	4A	7D	5B	27
	09 63	0702	02BE	4A	7E	5B	3D
	09 64	0703	02BF	4A	7F	5B	22
	09 65	0704	02C0	4B	40	2E	20
	09 66	0705	02C1	4B	C1	2E	41
	09 67	0706	02C2	4B	C2	2E	42
	09 68	0707	02C3	4B	C3	2E	43
	09 69	0708	02C4	4B	C4	2E	44
	09 70	0709	02C5	4B	C5	2E	45
	09 71	0710	02C6	4B	C6	2E	46
	09 72	0711	02C7	4B	C7	2E	47
	09 73	0712	02C8	4B	C8	2E	48
	09 74	0713	02C9	4B	C9	2E	49
	09 75	0714	02CA	4B	4A	2E	5B
	09 76	0715	02CB	4B	4B	2E	2E
	09 77	0716	02CC	4B	4C	2E	3C
	09 78	0717	02CD	4B	4D	2E	28
	09 79	0718	02CE	4B	4E	2E	2B
	09 80	0719	02CF	4B	4F	2E	21
	10 01	0720	02D0	4B	50	2E	26
	10 02	0721	02D1	4B	D1	2E	4A
	10 03	0722	02D2	4B	D2	2E	4B
	10 04	0723	02D3	4B	D3	2E	4C
	10 05	0724	02D4	4B	D4	2E	4D
	10 06	0725	02D5	4B	D5	2E	4E
	10 07	0726	02D6	4B	D6	2E	4F
	10 08	0727	02D7	4B	D7	2E	50
	10 09	0728	02D8	4B	D8	2E	51
	10 10	0729	02D9	4B	D9	2E	52
	10 11	0730	02DA	4B	5A	2E	5D
	10 12	0731	02DB	4B	5B	2E	24
	10 13	0732	02DC	4B	5C	2E	2A
	10 14	0733	02DD	4B	5D	2E	29
	10 15	0734	02DE	4B	5E	2E	3B
	10 16	0735	02DF	4B	5F	2E	5E
	10 17	0736	02E0	4B	60	2E	2D
	10 18	0737	02E1	4B	61	2E	2F
	10 19	0738	02E2	4B	E2	2E	53
	10 20	0739	02E3	4B	E3	2E	54
	10 21	0740	02E4	4B	E4	2E	55
	10 22	0741	02E5	4B	E5	2E	56
	10 23	0742	02E6	4B	E6	2E	57
	10 24	0743	02E7	4B	E7	2E	58

Mod 1 R C	Mods 2,3,4 R C	Position Dec	Position Hex	Buffer Address (Hex) EBCDIC		ASCII	
	10 25	0744	02E8	4B	E8	2E	59
	10 26	0745	02E9	4B	E9	2E	5A
	10 27	0746	02EA	4B	6A	2E	7C
	10 28	0747	02EB	4B	6B	2E	2C
	10 29	0748	02EC	4B	6C	2E	25
	10 30	0749	02ED	4B	6D	2E	5F
	10 31	0750	02EE	4B	6E	2E	3E
	10 32	0751	02EF	4B	6F	2E	3F
	10 33	0752	02F0	4B	F0	2E	30
	10 34	0753	02F1	4B	F1	2E	31
	10 35	0754	02F2	4B	F2	2E	32
	10 36	0755	02F3	4B	F3	2E	33
	10 37	0756	02F4	4B	F4	2E	34
	10 38	0757	02F5	4B	F5	2E	35
	10 39	0758	02F6	4B	F6	2E	36
	10 40	0759	02F7	4B	F7	2E	37
	10 41	0760	02F8	4B	F8	2E	38
	10 42	0761	02F9	4B	F9	2E	39
	10 43	0762	02FA	4B	7A	2E	3A
	10 44	0763	02FB	4B	7B	2E	23
	10 45	0764	02FC	4B	7C	2E	40
	10 46	0765	02FD	4B	7D	2E	27
	10 47	0766	02FE	4B	7E	2E	3D
	10 48	0767	02FF	4B	7F	2E	22
	10 49	0768	0300	4C	40	3C	20
	10 50	0769	0301	4C	C1	3C	41
	10 51	0770	0302	4C	C2	3C	42
	10 52	0771	0303	4C	C3	3C	43
	10 53	0772	0304	4C	C4	3C	44
	10 54	0773	0305	4C	C5	3C	45
	10 55	0774	0306	4C	C6	3C	46
	10 56	0775	0307	4C	C7	3C	47
	10 57	0776	0308	4C	C8	3C	48
	10 58	0777	0309	4C	C9	3C	49
	10 59	0778	030A	4C	4A	3C	5B
	10 60	0779	030B	4C	4B	3C	2E
	10 61	0780	030C	4C	4C	3C	3C
	10 62	0781	030D	4C	4D	3C	28
	10 63	0782	030E	4C	4E	3C	2B
	10 64	0783	030F	4C	4F	3C	21
	10 65	0784	0310	4C	50	3C	26
	10 66	0785	0311	4C	D1	3C	4A
	10 67	0786	0312	4C	D2	3C	4B
	10 68	0787	0313	4C	D3	3C	4C
	10 69	0788	0314	4C	D4	3C	4D
	10 70	0789	0315	4C	D5	3C	4E
	10 71	0790	0316	4C	D6	3C	4F
	10 72	0791	0317	4C	D7	3C	50
	10 73	0792	0318	4C	D8	3C	51
	10 74	0793	0319	4C	D9	3C	52
	10 75	0794	031A	4C	5A	3C	5D
	10 76	0795	031B	4C	5B	3C	24
	10 77	0796	031C	4C	5C	3C	2A
	10 78	0797	031D	4C	5D	3C	29
	10 79	0798	031E	4C	5E	3C	3B
	10 80	0799	031F	4C	5F	3C	5E
	11 01	0800	0320	4C	60	3C	2D
	11 02	0801	0321	4C	61	3C	2F
	11 03	0802	0322	4C	E2	3C	53
	11 04	0803	0323	4C	E3	3C	54
	11 05	0804	0324	4C	E4	3C	55
	11 06	0805	0325	4C	E5	3C	56
	11 07	0806	0326	4C	E6	3C	57
	11 08	0807	0327	4C	E7	3C	58
	11 09	0808	0328	4C	E8	3C	59
	11 10	0809	0329	4C	E9	3C	5A
	11 11	0810	032A	4C	6A	3C	7C
	11 12	0811	032B	4C	6B	3C	2C
	11 13	0812	032C	4C	6C	3C	25
	11 14	0813	032D	4C	6D	3C	5F
	11 15	0814	032E	4C	6E	3C	3E
	11 16	0815	032F	4C	6F	3C	3F
	11 17	0816	0330	4C	F0	3C	30
	11 18	0817	0331	4C	F1	3C	31
	11 19	0818	0332	4C	F2	3C	32
	11 20	0819	0333	4C	F3	3C	33
	11 21	0820	0334	4C	F4	3C	34
	11 22	0821	0335	4C	F5	3C	35
	11 23	0822	0336	4C	F6	3C	36
	11 24	0823	0337	4C	F7	3C	37
	11 25	0824	0338	4C	F8	3C	38
	11 26	0825	0339	4C	F9	3C	39
	11 27	0826	033A	4C	7A	3C	3A
	11 28	0827	033B	4C	7B	3C	23
	11 29	0828	033C	4C	7C	3C	40
	11 30	0829	033D	4C	7D	3C	27
	11 31	0830	033E	4C	7E	3C	3D
	11 32	0831	033F	4C	7F	3C	22
	11 33	0832	0340	4D	40	28	20
	11 34	0833	0341	4D	C1	28	41
	11 35	0834	0342	4D	C2	28	42
	11 36	0835	0343	4D	C3	28	43
	11 37	0836	0344	4D	C4	28	44
	11 38	0837	0345	4D	C5	28	45
	11 39	0838	0346	4D	C6	28	46
	11 40	0839	0347	4D	C7	28	47
	11 41	0840	0348	4D	C8	28	48
	11 42	0841	0349	4D	C9	28	49
	11 43	0842	034A	4D	4A	28	5B
	11 44	0843	034B	4D	4B	28	2E
	11 45	0844	034C	4D	4C	28	3C
	11 46	0845	034D	4D	4D	28	28
	11 47	0846	034E	4D	4E	28	2B
	11 48	0847	034F	4D	4F	28	21
	11 49	0848	0350	4D	50	28	26
	11 50	0849	0351	4D	D1	28	4A
	11 51	0850	0352	4D	D2	28	4B
	11 52	0851	0353	4D	D3	28	4C
	11 53	0852	0354	4D	D4	28	4D
	11 54	0853	0355	4D	D5	28	4E
	11 55	0854	0356	4D	D6	28	4F
	11 56	0855	0357	4D	D7	28	50
	11 57	0856	0358	4D	D8	28	51
	11 58	0857	0359	4D	D9	28	52
	11 59	0858	035A	4D	5A	28	5D
	11 60	0859	035B	4D	5B	28	24
	11 61	0860	035C	4D	5C	28	2A
	11 62	0861	035D	4D	5D	28	29
	11 63	0862	035E	4D	5E	28	3B
	11 64	0863	035F	4D	5F	28	5E
	11 65	0864	0360	4D	60	28	2D
	11 66	0865	0361	4D	61	28	2F
	11 67	0866	0362	4D	E2	28	53
	11 68	0867	0363	4D	E3	28	54

Mod 1 R C	Mods 2,3,4 R C	Position Dec Hex	EBCDIC		ASCII	
	11 69	0868 0364	4D	E4	28	55
	11 70	0869 0365	4D	E5	28	56
	11 71	0870 0366	4D	E6	28	57
	11 72	0871 0367	4D	E7	28	58
	11 73	0872 0368	4D	E8	28	59
	11 74	0873 0369	4D	E9	28	5A
	11 75	0874 036A	4D	6A	28	7C
	11 76	0875 036B	4D	6B	28	2C
	11 77	0876 036C	4D	6C	28	25
	11 78	0877 036D	4D	6D	28	5F
	11 79	0878 036E	4D	6E	28	3E
	11 80	0879 036F	4D	6F	28	3F
	12 01	0880 0370	4D	F0	28	30
	12 02	0881 0371	4D	F1	28	31
	12 03	0882 0372	4D	F2	28	32
	12 04	0883 0373	4D	F3	28	33
	12 05	0884 0374	4D	F4	28	34
	12 06	0885 0375	4D	F5	28	35
	12 07	0886 0376	4D	F6	28	36
	12 08	0887 0377	4D	F7	28	37
	12 09	0888 0378	4D	F8	28	38
	12 10	0889 0379	4D	F9	28	39
	12 11	0890 037A	4D	7A	28	3A
	12 12	0891 037B	4D	7B	28	23
	12 13	0892 037C	4D	7C	28	40
	12 14	0893 037D	4D	7D	28	27
	12 15	0894 037E	4D	7E	28	3D
	12 16	0895 037F	4D	7F	28	22
	12 17	0896 0380	4E	40	2B	20
	12 18	0897 0381	4E	C1	2B	41
	12 19	0898 0382	4E	C2	2B	42
	12 20	0899 0383	4E	C3	2B	43
	12 21	0900 0384	4E	C4	2B	44
	12 22	0901 0385	4E	C5	2B	45
	12 23	0902 0386	4E	C6	2B	46
	12 24	0903 0387	4E	C7	2B	47
	12 25	0904 0388	4E	C8	2B	48
	12 26	0905 0389	4E	C9	2B	49
	12 27	0906 038A	4E	4A	2B	5B
	12 28	0907 038B	4E	4B	2B	2E
	12 29	0908 038C	4E	4C	2B	3C
	12 30	0909 038D	4E	4D	2B	28
	12 31	0910 038E	4E	4E	2B	2B
	12 32	0911 038F	4E	4F	2B	21
	12 33	0912 0390	4E	50	2B	26
	12 34	0913 0391	4E	D1	2B	4A
	12 35	0914 0392	4E	D2	2B	4B
	12 36	0915 0393	4E	D3	2B	4C
	12 37	0916 0394	4E	D4	2B	4D
	12 38	0917 0395	4E	D5	2B	4E
	12 39	0918 0396	4E	D6	2B	4F
	12 40	0919 0397	4E	D7	2B	50
	12 41	0920 0398	4E	D8	2B	51
	12 42	0921 0399	4E	D9	2B	52
	12 43	0922 039A	4E	5A	2B	5D
	12 44	0923 039B	4E	5B	2B	24
	12 45	0924 039C	4E	5C	2B	2A
	12 46	0925 039D	4E	5D	2B	29
	12 47	0926 039E	4E	5E	2B	3B
	12 48	0927 039F	4E	5F	2B	5E
	12 49	0928 03A0	4E	60	2B	2D
	12 50	0929 03A1	4E	61	2B	2F

Mod 1 R C	Mods 2,3,4 R C	Position Dec Hex	EBCDIC		ASCII	
	12 51	0930 03A2	4E	E2	2B	53
	12 52	0931 03A3	4E	E3	2B	54
	12 53	0932 03A4	4E	E4	2B	55
	12 54	0933 03A5	4E	E5	2B	56
	12 55	0934 03A6	4E	E6	2B	57
	12 56	0935 03A7	4E	E7	2B	58
	12 57	0936 03A8	4E	E8	2B	59
	12 58	0937 03A9	4E	E9	2B	5A
	12 59	0938 03AA	4E	6A	2B	7C
	12 60	0939 03AB	4E	6B	2B	2C
	12 61	0940 03AC	4E	6C	2B	25
	12 62	0941 03AD	4E	6D	2B	5F
	12 63	0942 03AE	4E	6E	2B	3E
	12 64	0943 03AF	4E	6F	2B	3F
	12 65	0944 03B0	4E	F0	2B	30
	12 66	0945 03B1	4E	F1	2B	31
	12 67	0946 03B2	4E	F2	2B	32
	12 68	0947 03B3	4E	F3	2B	33
	12 69	0948 03B4	4E	F4	2B	34
	12 70	0949 03B5	4E	F5	2B	35
	12 71	0950 03B6	4E	F6	2B	36
	12 72	0951 03B7	4E	F7	2B	37
	12 73	0952 03B8	4E	F8	2B	38
	12 74	0953 03B9	4E	F9	2B	39
	12 75	0954 03BA	4E	7A	2B	3A
	12 76	0955 03BB	4E	7B	2B	23
	12 77	0956 03BC	4E	7C	2B	40
	12 78	0957 03BD	4E	7D	2B	27
	12 79	0958 03BE	4E	7E	2B	3D
	12 80	0959 03BF	4E	7F	2B	22
	13 01	0960 03C0	4F	40	21	20
	13 02	0961 03C1	4F	C1	21	41
	13 03	0962 03C2	4F	C2	21	42
	13 04	0963 03C3	4F	C3	21	43
	13 05	0964 03C4	4F	C4	21	44
	13 06	0965 03C5	4F	C5	21	45
	13 07	0966 03C6	4F	C6	21	46
	13 08	0967 03C7	4F	C7	21	47
	13 09	0968 03C8	4F	C8	21	48
	13 10	0969 03C9	4F	C9	21	49
	13 11	0970 03CA	4F	4A	21	5B
	13 12	0971 03CB	4F	4B	21	2E
	13 13	0972 03CC	4F	4C	21	3C
	13 14	0973 03CD	4F	4D	21	28
	13 15	0974 03CE	4F	4E	21	2B
	13 16	0975 03CF	4F	4F	21	21
	13 17	0976 03D0	4F	50	21	26
	13 18	0977 03D1	4F	D1	21	4A
	13 19	0978 03D2	4F	D2	21	4B
	13 20	0979 03D3	4F	D3	21	4C
	13 21	0980 03D4	4F	D4	21	4D
	13 22	0981 03D5	4F	D5	21	4E
	13 23	0982 03D6	4F	D6	21	4F
	13 24	0983 03D7	4F	D7	21	50
	13 25	0984 03D8	4F	D8	21	51
	13 26	0985 03D9	4F	D9	21	52
	13 27	0986 03DA	4F	5A	21	5D
	13 28	0987 03DB	4F	5B	21	24
	13 29	0988 03DC	4F	5C	21	2A
	13 30	0989 03DD	4F	5D	21	29
	13 31	0990 03DE	4F	5E	21	3B
	13 32	0991 03DF	4F	5F	21	5E

Mod 1 R C	Mods 2,3,4 R C	Position Dec	Position Hex	EBCDIC		ASCII	
	13 33	0992	03E0	4F	60	21	2D
	13 34	0993	03E1	4F	61	21	2F
	13 35	0994	03E2	4F	E2	21	53
	13 36	0995	03E3	4F	E3	21	54
	13 37	0996	03E4	4F	E4	21	55
	13 38	0997	03E5	4F	E5	21	56
	13 39	0998	03E6	4F	E6	21	57
	13 40	0999	03E7	4F	E7	21	58
	13 41	1000	03E8	4F	E8	21	59
	13 42	1001	03E9	4F	E9	21	5A
	13 43	1002	03EA	4F	6A	21	7C
	13 44	1003	03EB	4F	6B	21	2C
	13 45	1004	03EC	4F	6C	21	25
	13 46	1005	03ED	4F	6D	21	5F
	13 47	1006	03EE	4F	6E	21	3E
	13 48	1007	03EF	4F	6F	21	3F
	13 49	1008	03F0	4F	F0	21	30
	13 50	1009	03F1	4F	F1	21	31
	13 51	1010	03F2	4F	F2	21	32
	13 52	1011	03F3	4F	F3	21	33
	13 53	1012	03F4	4F	F4	21	34
	13 54	1013	03F5	4F	F5	21	35
	13 55	1014	03F6	4F	F6	21	36
	13 56	1015	03F7	4F	F7	21	37
	13 57	1016	03F8	4F	F8	21	38
	13 58	1017	03F9	4F	F9	21	39
	13 59	1018	03FA	4F	7A	21	3A
	13 60	1019	03FB	4F	7B	21	23
	13 61	1020	03FC	4F	7C	21	40
	13 62	1021	03FD	4F	7D	21	27
	13 63	1022	03FE	4F	7E	21	3D
	13 64	1023	03FF	4F	7F	21	22
	13 65	1024	0400	50	40	26	20
	13 66	1025	0401	50	C1	26	41
	13 67	1026	0402	50	C2	26	42
	13 68	1027	0403	50	C3	26	43
	13 69	1028	0404	50	C4	26	44
	13 70	1029	0405	50	C5	26	45
	13 71	1030	0406	50	C6	26	46
	13 72	1031	0407	50	C7	26	47
	13 73	1032	0408	50	C8	26	48
	13 74	1033	0409	50	C9	26	49
	13 75	1034	040A	50	4A	26	5B
	13 76	1035	040B	50	4B	26	2E
	13 77	1036	040C	50	4C	26	3C
	13 78	1037	040D	50	4D	26	28
	13 79	1038	040E	50	4E	26	2B
	13 80	1039	040F	50	4F	26	21
	14 01	1040	0410	50	50	26	26
	14 02	1041	0411	50	D1	26	4A
	14 03	1042	0412	50	D2	26	4B
	14 04	1043	0413	50	D3	26	4C
	14 05	1044	0414	50	D4	26	4D
	14 06	1045	0415	50	D5	26	4E
	14 07	1046	0416	50	D6	26	4F
	14 08	1047	0417	50	D7	26	50
	14 09	1048	0418	50	D8	26	51
	14 10	1049	0419	50	D9	26	52
	14 11	1050	041A	50	5A	26	5D
	14 12	1051	041B	50	5B	26	24
	14 13	1052	041C	50	5C	26	2A
	14 14	1053	041D	50	5D	26	29
	14 15	1054	041E	50	5E	26	3B
	14 16	1055	041F	50	5F	26	5E
	14 17	1056	0420	50	60	26	2D
	14 18	1057	0421	50	61	26	2F
	14 19	1058	0422	50	E2	26	53
	14 20	1059	0423	50	E3	26	54
	14 21	1060	0424	50	E4	26	55
	14 22	1061	0425	50	E5	26	56
	14 23	1062	0426	50	E6	26	57
	14 24	1063	0427	50	E7	26	58
	14 25	1064	0428	50	E8	26	59
	14 26	1065	0429	50	E9	26	5A
	14 27	1066	042A	50	6A	26	7C
	14 28	1067	042B	50	6B	26	2C
	14 29	1068	042C	50	6C	26	25
	14 30	1069	042D	50	6D	26	5F
	14 31	1070	042E	50	6E	26	3E
	14 32	1071	042F	50	6F	26	3F
	14 33	1072	0430	50	F0	26	30
	14 34	1073	0431	50	F1	26	31
	14 35	1074	0432	50	F2	26	32
	14 36	1075	0433	50	F3	26	33
	14 37	1076	0434	50	F4	26	34
	14 38	1077	0435	50	F5	26	35
	14 39	1078	0436	50	F6	26	36
	14 40	1079	0437	50	F7	26	37
	14 41	1080	0438	50	F8	26	38
	14 42	1081	0439	50	F9	26	39
	14 43	1082	043A	50	7A	26	3A
	14 44	1083	043B	50	7B	26	23
	14 45	1084	043C	50	7C	26	40
	14 46	1085	043D	50	7D	26	27
	14 47	1086	043E	50	7E	26	3D
	14 48	1087	043F	50	7F	26	22
	14 49	1088	0440	D1	40	4A	20
	14 50	1089	0441	D1	C1	4A	41
	14 51	1090	0442	D1	C2	4A	42
	14 52	1091	0443	D1	C3	4A	43
	14 53	1092	0444	D1	C4	4A	44
	14 54	1093	0445	D1	C5	4A	45
	14 55	1094	0446	D1	C6	4A	46
	14 56	1095	0447	D1	C7	4A	47
	14 57	1096	0448	D1	C8	4A	48
	14 58	1097	0449	D1	C9	4A	49
	14 59	1098	044A	D1	4A	4A	5B
	14 60	1099	044B	D1	4B	4A	2E
	14 61	1100	044C	D1	4C	4A	3C
	14 62	1101	044D	D1	4D	4A	28
	14 63	1102	044E	D1	4E	4A	2B
	14 64	1103	044F	D1	4F	4A	21
	14 65	1104	0450	D1	50	4A	26
	14 66	1105	0451	D1	D1	4A	4A
	14 67	1106	0452	D1	D2	4A	4B
	14 68	1107	0453	D1	D3	4A	4C
	14 69	1108	0454	D1	D4	4A	4D
	14 70	1109	0455	D1	D5	4A	4E
	14 71	1110	0456	D1	D6	4A	4F
	14 72	1111	0457	D1	D7	4A	50
	14 73	1112	0458	D1	D8	4A	51
	14 74	1113	0459	D1	D9	4A	52
	14 75	1114	045A	D1	5A	4A	5D
	14 76	1115	045B	D1	5B	4A	24

Mod 1 R C	Mods 2,3,4 R C	Position Dec Hex	Buffer Address (Hex) EBCDIC		ASCII	
	14 77	1116 045C	D1	5C	4A	2A
	14 78	1117 045D	D1	5D	4A	29
	14 79	1118 045E	D1	5E	4A	3B
	14 80	1119 045F	D1	5F	4A	5E
	15 01	1120 0460	D1	60	4A	2D
	15 02	1121 0461	D1	61	4A	2F
	15 03	1122 0462	D1	E2	4A	53
	15 04	1123 0463	D1	E3	4A	54
	15 05	1124 0464	D1	E4	4A	55
	15 06	1125 0465	D1	E5	4A	56
	15 07	1126 0466	D1	E6	4A	57
	15 08	1127 0467	D1	E7	4A	58
	15 09	1128 0468	D1	E8	4A	59
	15 10	1129 0469	D1	E9	4A	5A
	15 11	1130 046A	D1	6A	4A	7C
	15 12	1131 046B	D1	6B	4A	2C
	15 13	1132 046C	D1	6C	4A	25
	15 14	1133 046D	D1	6D	4A	5F
	15 15	1134 046E	D1	6E	4A	3E
	15 16	1135 046F	D1	6F	4A	3F
	15 17	1136 0470	D1	F0	4A	30
	15 18	1137 0471	D1	F1	4A	31
	15 19	1138 0472	D1	F2	4A	32
	15 20	1139 0473	D1	F3	4A	33
	15 21	1140 0474	D1	F4	4A	34
	15 22	1141 0475	D1	F5	4A	35
	15 23	1142 0476	D1	F6	4A	36
	15 24	1143 0477	D1	F7	4A	37
	15 25	1144 0478	D1	F8	4A	38
	15 26	1145 0479	D1	F9	4A	39
	15 27	1146 047A	D1	7A	4A	3A
	15 28	1147 047B	D1	7B	4A	23
	15 29	1148 047C	D1	7C	4A	40
	15 30	1149 047D	D1	7D	4A	27
	15 31	1150 047E	D1	7E	4A	3D
	15 32	1151 047F	D1	7F	4A	22
	15 33	1152 0480	D2	40	4B	20
	15 34	1153 0481	D2	C1	4B	41
	15 35	1154 0482	D2	C2	4B	42
	15 36	1155 0483	D2	C3	4B	43
	15 37	1156 0484	D2	C4	4B	44
	15 38	1157 0485	D2	C5	4B	45
	15 39	1158 0486	D2	C6	4B	46
	15 40	1159 0487	D2	C7	4B	47
	15 41	1160 0488	D2	C8	4B	48
	15 42	1161 0489	D2	C9	4B	49
	15 43	1162 048A	D2	4A	4B	5B
	15 44	1163 048B	D2	4B	4B	2E
	15 45	1164 048C	D2	4C	4B	3C
	15 46	1165 048D	D2	4D	4B	28
	15 47	1166 048E	D2	4E	4B	2B
	15 48	1167 048F	D2	4F	4B	21
	15 49	1168 0490	D2	50	4B	26
	15 50	1169 0491	D2	D1	4B	4A
	15 51	1170 0492	D2	D2	4B	4B
	15 52	1171 0493	D2	D3	4B	4C
	15 53	1172 0494	C2	D4	4B	4D
	15 54	1173 0495	D2	D5	4B	4E
	15 55	1174 0496	D2	D6	4B	4F
	15 56	1175 0497	D2	D7	4B	50
	15 57	1176 0498	D2	D8	4B	51
	15 58	1177 0499	D2	D9	4B	52

Mod 1 R C	Mods 2,3,4 R C	Position Dec Hex	Buffer Address (Hex) EBCDIC		ASCII	
	15 59	1178 049A	D2	5A	4B	5D
	15 60	1179 049B	D2	5B	4B	24
	15 61	1180 049C	D2	5C	4B	2A
	15 62	1181 049D	D2	5D	4B	29
	15 63	1182 049E	D2	5E	4B	3B
	15 64	1183 049F	D2	5F	4B	5E
	15 65	1184 04A0	D2	60	4B	2D
	15 66	1185 04A1	D2	61	4B	2F
	15 67	1186 04A2	D2	E2	4B	53
	15 68	1187 04A3	D2	E3	4B	54
	15 69	1188 04A4	D2	E4	4B	55
	15 70	1189 04A5	D2	E5	4B	56
	15 71	1190 04A6	D2	E6	4B	57
	15 72	1191 04A7	D2	E7	4B	58
	15 73	1192 04A8	D2	E8	4B	59
	15 74	1193 04A9	D2	E9	4B	5A
	15 75	1194 04AA	D2	6A	4B	7C
	15 76	1195 04AB	D2	6B	4B	2C
	15 77	1196 04AC	D2	6C	4B	25
	15 78	1197 04AD	D2	6D	4B	5F
	15 79	1198 04AE	D2	6E	4B	3E
	15 80	1199 04AF	D2	6F	4B	3F
	16 01	1200 04B0	D2	F0	4B	30
	16 02	1201 04B1	D2	F1	4B	31
	16 03	1202 04B2	D2	F2	4B	32
	16 04	1203 04B3	D2	F3	4B	33
	16 05	1204 04B4	D2	F4	4B	34
	16 06	1205 04B5	D2	F5	4B	35
	16 07	1206 04B6	D2	F6	4B	36
	16 08	1207 04B7	D2	F7	4B	37
	16 09	1208 04B8	D2	F8	4B	38
	16 10	1209 04B9	D2	F9	4B	39
	16 11	1210 04BA	D2	7A	4B	3A
	16 12	1211 04BB	D2	7B	4B	23
	16 13	1212 04BC	D2	7C	4B	40
	16 14	1213 04BD	D2	7D	4B	27
	16 15	1214 04BE	D2	7E	4B	3D
	16 16	1215 04BF	D2	7F	4B	22
	16 17	1216 04C0	D3	40	4C	20
	16 18	1217 94C1	D3	C1	4C	41
	16 19	1218 04C2	D3	C2	4C	42
	16 20	1219 04C3	D3	C3	4C	43
	16 21	1220 04C4	D3	C4	4C	44
	16 22	1221 04C5	D3	C5	4C	45
	16 23	1222 04C6	D3	C6	4C	46
	16 24	1223 04C7	D3	C7	4C	47
	16 25	1224 04C8	D3	C8	4C	48
	16 26	1225 04C9	D3	C9	4C	49
	16 27	1226 04CA	D3	4A	4C	5B
	16 28	1227 04CB	D3	4B	4C	2E
	16 29	1228 04CC	D3	4C	4C	3C
	16 30	1229 04CD	D3	4D	4C	28
	16 31	1230 04CE	D3	4E	4C	2B
	16 32	1231 04CF	D3	4F	4C	21
	16 33	1232 04D0	D3	50	4C	26
	16 34	1233 04D1	D3	D1	4C	4A
	16 35	1234 04D2	D3	D2	4C	4B
	16 36	1235 04D3	D3	D3	4C	4C
	16 37	1236 04D4	D3	D4	4C	4D
	16 38	1237 04D5	D3	D5	4C	4E
	16 39	1238 04D6	D3	D6	4C	4F
	16 40	1239 04D7	D3	D7	4C	50

Mod 1 R C	Mods 2,3,4 R C	Position Dec	Hex	EBCDIC		ASCII	
	16 41	1240	04D8	D3	D8	4C	51
	16 42	1241	04D9	D3	D9	4C	52
	16 43	1242	04DA	D3	5A	4C	5D
	16 44	1243	04DB	D3	5B	4C	24
	16 45	1244	04DC	D3	5C	4C	2A
	16 46	1245	04DD	D3	5D	4C	29
	16 47	1246	04DE	D3	5E	4C	3B
	16 48	1247	04DF	D3	5F	4C	5E
	16 49	1248	04E0	D3	60	4C	2D
	16 50	1249	04E1	D3	61	4C	2F
	16 51	1250	04E2	D3	E2	4C	53
	16 52	1251	04E3	D3	E3	4C	54
	16 53	1252	04E4	D3	E4	4C	55
	16 54	1253	04E5	D3	E5	4C	56
	16 55	1254	04E6	D3	E6	4C	57
	16 56	1255	04E7	D3	E7	4C	58
	16 57	1256	04E8	D3	E8	4C	59
	16 58	1257	04E9	D3	E9	4C	5A
	16 59	1258	04EA	D3	6A	4C	7C
	16 60	1259	04EB	D3	6B	4C	2C
	16 61	1260	04EC	D3	6C	4C	25
	16 62	1261	04ED	D3	6D	4C	5F
	16 63	1262	04EE	D3	6E	4C	3E
	16 64	1263	04EF	D3	6F	4C	3F
	16 65	1264	04F0	D3	F0	4C	30
	16 66	1265	04F1	D3	F1	4C	31
	16 67	1266	04F2	D3	F2	4C	32
	16 68	1267	04F3	D3	F3	4C	33
	16 69	1268	04F4	D3	F4	4C	34
	16 70	1269	04F5	D3	F5	4C	35
	16 71	1270	04F6	D3	F6	4C	36
	16 72	1271	04F7	D3	F7	4C	37
	16 73	1272	04F8	D3	F8	4C	38
	16 74	1273	04F9	D3	F9	4C	39
	16 75	1274	04FA	D3	7A	4C	3A
	16 76	1275	04FB	D3	7B	4C	23
	16 77	1276	04FC	D3	7C	4C	40
	16 78	1277	04FD	D3	7D	4C	27
	16 79	1278	04FE	D3	7E	4C	3D
	16 80	1279	04FF	D3	7F	4C	22
	17 01	1280	0500	D4	40	4D	20
	17 02	1281	0501	D4	C1	4D	41
	17 03	1282	0502	D4	C2	4D	42
	17 04	1283	0503	D4	C3	4D	43
	17 05	1284	0504	D4	C4	4D	44
	17 06	1285	0505	D4	C5	4D	45
	17 07	1286	0506	D4	C6	4D	46
	17 08	1287	0507	D4	C7	4D	47
	17 09	1288	0508	D4	C8	4D	48
	17 10	1289	0509	D4	C9	4D	49
	17 11	1290	050A	D4	4A	4D	5B
	17 12	1291	050B	D4	4B	4D	2E
	17 13	1292	050C	D4	4C	4D	3C
	17 14	1293	050D	D4	4D	4D	28
	17 15	1294	050E	D4	4E	4D	2B
	17 16	1295	050F	D4	4F	4D	21
	17 17	1296	0510	D4	50	4D	26
	17 18	1297	0511	D4	D1	4D	4A
	17 19	1298	0512	D4	D2	4D	4B
	17 20	1299	0513	D4	D3	4D	4C
	17 21	1300	0514	D4	D4	4D	4D
	17 22	1301	0515	D4	D5	4D	4E
	17 23	1302	0516	D4	D6	4D	4F
	17 24	1303	0517	D4	D7	4D	50
	17 25	1304	0518	D4	D8	4D	51
	17 26	1305	0519	D4	D9	4D	52
	17 27	1306	051A	D4	5A	4D	5D
	17 28	1307	051B	D4	5B	4D	24
	17 29	1308	051C	D4	5C	4D	2A
	17 30	1309	051D	D4	5D	4D	29
	17 31	1310	051E	D4	5E	4D	3B
	17 32	1311	051F	D4	5F	4D	5E
	17 33	1312	0520	D4	60	4D	2D
	17 34	1313	0521	D4	61	4D	2F
	17 35	1314	0522	D4	E2	4D	53
	17 36	1315	0523	D4	E3	4D	54
	17 37	1316	0524	D4	E4	4D	55
	17 38	1317	0525	D4	E5	4D	56
	17 39	1318	0526	D4	E6	4D	57
	17 40	1319	0527	D4	E7	4D	58
	17 41	1320	0528	D4	E8	4D	59
	17 42	1321	0529	D4	E9	4D	5A
	17 43	1322	052A	D4	6A	4D	7C
	17 44	1323	052B	D4	6B	4D	2C
	17 45	1324	052C	D4	6C	4D	25
	17 46	1325	052D	D4	6D	4D	5F
	17 47	1326	052E	D4	6E	4D	3E
	17 48	1327	052F	D4	6F	4D	3F
	17 49	1328	0530	D4	F0	4D	30
	17 50	1329	0531	D4	F1	4D	31
	17 51	1330	0532	D4	F2	4D	32
	17 52	1331	0533	D4	F3	4D	33
	17 53	1332	0534	D4	F4	4D	34
	17 54	1333	0535	D4	F5	4D	35
	17 55	1334	0536	D4	F6	4D	36
	17 56	1335	0537	D4	F7	4D	37
	17 57	1336	0538	D4	F8	4D	38
	17 58	1337	0539	D4	F9	4D	39
	17 59	1338	053A	D4	7A	4D	3A
	17 60	1339	053B	D4	7B	4D	23
	17 61	1340	053C	D4	7C	4D	40
	17 62	1341	053D	D4	7D	4D	27
	17 63	1342	053E	D4	7E	4D	3D
	17 64	1343	053F	D4	7F	4D	22
	17 65	1344	0540	D5	40	4E	20
	17 66	1345	0541	D5	C1	4E	41
	17 67	1346	0542	D5	C2	4E	42
	17 68	1347	0543	D5	C3	4E	43
	17 69	1348	0544	D5	C4	4E	44
	17 70	1349	0545	D5	C5	4E	45
	17 71	1350	0546	D5	C6	4E	46
	17 72	1351	0547	D5	C7	4E	47
	17 73	1352	0548	D5	C8	4E	48
	17 74	1353	0549	D5	C9	4E	49
	17 75	1354	054A	D5	4A	4E	5B
	17 76	1355	054B	D5	4B	4E	2E
	17 77	1356	054C	D5	4C	4E	3C
	17 78	1357	054D	D5	4D	4E	28
	17 79	1358	054E	D5	4E	4E	2B
	17 80	1359	054F	D5	4F	4E	21
	18 01	1360	0550	D5	50	4E	26
	18 02	1361	0551	D5	D1	4E	4A
	18 03	1362	0552	D5	D2	4E	4B
	18 04	1363	0553	D5	D3	4E	4C

Mod 1 R C	Mods 2,3,4 R C	Position Dec	Position Hex	Buffer Address (Hex) EBCDIC		Buffer Address (Hex) ASCII		Mod 1 R C	Mods 2,3,4 R C	Position Dec	Position Hex	Buffer Address (Hex) EBCDIC		Buffer Address (Hex) ASCII	
	18 05	1364	0554	D5	D4	4E	4D		18 67	1426	0592	D6	D2	4F	4B
	18 06	1365	0555	D5	D5	4E	4E		18 68	1427	0593	D6	D3	4F	4C
	18 07	1366	0556	D5	D6	4E	4F		18 69	1428	0594	D6	D4	4F	4D
	18 08	1367	0557	D5	D7	4E	50		18 70	1429	0595	D6	D5	4F	4E
	18 09	1368	0558	D5	D8	4E	51		18 71	1430	0596	D6	D6	4F	4F
	18 10	1369	0559	D5	D9	4E	52		18 72	1431	0597	D6	D7	4F	50
	18 11	1370	055A	D5	5A	4E	5D		18 73	1432	0598	D6	D8	4F	51
	18 12	1371	055B	D5	5B	4E	24		18 74	1433	0599	D6	D9	4F	52
	18 13	1372	055C	D5	5C	4E	2A		18 75	1434	059A	D6	5A	4F	5D
	18 14	1373	055D	D5	5D	4E	29		18 76	1435	059B	D6	5B	4F	24
	18 15	1374	055E	D5	5E	4E	3B		18 77	1436	059C	D6	5C	4F	2A
	18 16	1375	055F	D5	5F	4E	5E		18 78	1437	059D	D6	5D	4F	29
	18 17	1376	0560	D5	60	4E	2D		18 79	1438	059E	D6	5E	4F	3B
	18 18	1377	0561	D5	61	4E	2F		18 80	1439	059F	D6	5F	4F	5E
	18 19	1378	0562	D5	E2	4E	53		19 01	1440	05A0	D6	60	4F	2D
	18 20	1379	0563	D5	E3	4E	54		19 02	1441	05A1	D6	61	4F	2F
	18 21	1380	0564	D5	E4	4E	55		19 03	1442	05A2	D6	E2	4F	53
	18 22	1381	0565	D5	E5	4E	56		19 04	1443	05A3	D6	E3	4F	54
	18 23	1382	0566	D5	E6	4E	57		19 05	1444	05A4	D6	E4	4F	55
	18 24	1383	0567	D5	E7	4E	58		19 06	1445	05A5	D6	E5	4F	56
	18 25	1384	0568	D5	E8	4E	59		19 07	1446	05A6	D6	E6	4F	57
	18 26	1385	0569	D5	E9	4E	5A		19 08	1447	05A7	D6	E7	4F	58
	18 27	1386	056A	D5	6A	4E	7C		19 09	1448	05A8	D6	E8	4F	59
	18 28	1387	056B	D5	6B	4E	2C		19 10	1449	05A9	D6	E9	4F	5A
	18 29	1388	056C	D5	6C	4E	25		19 11	1450	05AA	D6	6A	4F	7C
	18 30	1389	056D	D5	6D	4E	5F		19 12	1451	05AB	D6	6B	4F	2C
	18 31	1390	056E	D5	6E	4E	3E		19 13	1452	05AC	D6	6C	4F	25
	18 32	1391	056F	D5	6F	4E	3F		19 14	1453	05AD	D6	6D	4F	5F
	18 33	1392	0570	D5	F0	4E	30		19 15	1454	05AE	D6	6E	4F	3E
	18 34	1393	0571	D5	F1	4E	31		19 16	1455	05AF	D6	6F	4F	3F
	18 35	1394	0572	D5	F2	4E	32		19 17	1456	05B0	D6	F0	4F	30
	18 36	1395	0573	D5	F3	4E	33		19 18	1457	05B1	D6	F1	4F	31
	18 37	1396	0574	D5	F4	4E	34		19 19	1458	05B2	D6	F2	4F	32
	18 38	1397	0575	D5	F5	4E	35		19 20	1459	05B3	D6	F3	4F	33
	18 39	1398	0576	D5	F6	4E	36		19 21	1460	05B4	D6	F4	4F	34
	18 40	1399	0577	D5	F7	4E	37		19 22	1461	05B5	D6	F5	4F	35
	18 41	1400	0578	D5	F8	4E	38		19 23	1462	05B6	D6	F6	4F	36
	18 42	1401	0579	D5	F9	4E	39		19 24	1463	05B7	D6	F7	4F	37
	18 43	1402	057A	D5	7A	4E	3A		19 25	1464	05B8	D6	F8	4F	38
	18 44	1403	057B	D5	7B	4E	23		19 26	1465	05B9	D6	F9	4F	39
	18 45	1404	057C	D5	7C	4E	40		19 27	1466	05BA	D6	7A	4F	3A
	18 46	1405	057D	D5	7D	4E	27		19 28	1467	05BB	D6	7B	4F	23
	18 47	1406	057E	D5	7E	4E	3D		19 29	1468	05BC	D6	7C	4F	40
	18 48	1407	057F	D5	7F	4E	22		19 30	1469	05BD	D6	7D	4F	27
	18 49	1408	0580	D6	40	4F	20		19 31	1470	05BE	D6	7E	4F	3D
	18 50	1409	0581	D6	C1	4F	41		19 32	1471	05BF	D6	7F	4F	22
	18 51	1410	0582	D6	C2	4F	42		19 33	1472	05C0	D7	40	50	20
	18 52	1411	0583	D6	C3	4F	43		19 34	1473	05C1	D7	C1	50	41
	18 53	1412	0584	D6	C4	4F	44		19 35	1474	05C2	D7	C2	50	42
	18 54	1413	0585	D6	C5	4F	45		19 36	1475	05C3	D7	C3	50	43
	18 55	1414	0586	D6	C6	4F	46		19 37	1476	05C4	D7	C4	50	44
	18 56	1415	0587	D6	C7	4F	47		19 38	1477	05C5	D7	C5	50	45
	18 57	1416	0588	D6	C8	4F	48		19 39	1478	05C6	D7	C6	50	46
	18 58	1417	0589	D6	C9	4F	49		19 40	1479	05C7	D7	C7	50	47
	18 59	1418	058A	D6	4A	4F	5B		19 41	1480	05C8	D7	C8	50	48
	18 60	1419	058B	D6	4B	4F	2E		19 42	1481	05C9	D7	C9	50	49
	18 61	1420	058C	D6	4C	4F	3C		19 43	1482	05CA	D7	4A	50	5B
	18 62	1421	058D	D6	4D	4F	28		19 44	1483	05CB	D7	4B	50	2E
	18 63	1422	058E	D6	4E	4F	2B		19 45	1484	05CC	D7	4C	50	3C
	18 64	1423	058F	D6	4F	4F	21		19 46	1485	05CD	D7	4D	50	28
	18 65	1424	0590	D6	50	4F	26		19 47	1486	05CE	D7	4E	50	2B
	18 66	1425	0591	D6	D1	4F	4A		19 48	1487	05CF	D7	4F	50	21

Mod 1 R C	Mods 2,3,4 R C	Position Dec	Hex	EBCDIC		ASCII	
	19 49	1488	05D0	D7	50	50	26
	19 50	1489	05D1	D7	D1	50	4A
	19 51	1490	05D2	D7	D2	50	4B
	19 52	1491	05D3	D7	D3	50	4C
	19 53	1492	05D4	D7	D4	50	4D
	19 54	1493	05D5	D7	D5	50	4E
	19 55	1494	05D6	D7	D6	50	4F
	19 56	1495	05D7	D7	D7	50	50
	19 57	1496	05D8	D7	D8	50	51
	19 58	1497	05D9	D7	D9	50	52
	19 59	1498	05DA	D7	5A	50	5D
	19 60	1499	05DB	D7	5B	50	24
	19 61	1500	05DC	D7	5C	50	2A
	19 62	1501	05DD	D7	5D	50	29
	19 63	1502	05DE	D7	5E	50	3B
	19 64	1503	05DF	D7	5F	50	5E
	19 65	1504	05E0	D7	60	50	2D
	19 66	1505	05E1	D7	61	50	2F
	19 67	1506	05E2	D7	E2	50	53
	19 68	1507	05E3	D7	E3	50	54
	19 69	1508	05E4	D7	E4	50	55
	19 70	1509	05E5	D7	E5	50	56
	19 71	1510	05E6	D7	E6	50	57
	19 72	1511	05E7	D7	E7	50	58
	19 73	1512	05E8	D7	E8	50	59
	19 74	1513	05E9	D7	E9	50	5A
	19 75	1514	05EA	D7	6A	50	7C
	19 76	1515	05EB	D7	6B	50	2C
	19 77	1516	05EC	D7	6C	50	25
	19 78	1517	05ED	D7	6D	50	5F
	19 79	1518	05EE	D7	6E	50	3E
	19 80	1519	05EF	D7	6F	50	3F
	20 01	1520	05F0	D7	F0	50	30
	20 02	1521	05F1	D7	F1	50	31
	20 03	1522	05F2	D7	F2	50	32
	20 04	1523	05F3	D7	F3	50	33
	20 05	1524	05F4	D7	F4	50	34
	20 06	1525	05F5	D7	F5	50	35
	20 07	1526	05F6	D7	F6	50	36
	20 08	1527	05F7	D7	F7	50	37
	20 09	1528	05F8	D7	F8	50	38
	20 10	1529	05F9	D7	F9	50	39
	20 11	1530	05FA	D7	7A	50	3A
	20 12	1531	05FB	D7	7B	50	23
	20 13	1532	05FC	D7	7C	50	40
	20 14	1533	05FD	D7	7D	50	27
	20 15	1534	05FE	D7	7E	50	3D
	20 16	1535	05FF	D7	7F	50	22
	20 17	1536	0600	D8	40	51	20
	20 18	1537	0601	D8	C1	51	41
	20 19	1538	0602	D8	C2	51	42
	20 20	1539	0603	D8	C3	51	43
	20 21	1540	0604	D8	C4	51	44
	20 22	1541	0605	D8	C5	51	45
	20 23	1542	0606	D8	C6	51	46
	20 24	1543	0607	D8	C7	51	47
	20 25	1544	0608	D8	C8	51	48
	20 26	1545	0609	D8	C9	51	49
	20 27	1546	060A	D8	4A	51	5B
	20 28	1547	060B	D8	4B	51	2E
	20 29	1548	060C	D8	4C	51	3C
	20 30	1549	060D	D8	4D	51	28

Mod 1 R C	Mods 2,3,4 R C	Position Dec	Hex	EBCDIC		ASCII	
	20 31	1550	060E	D8	4E	51	2B
	20 32	1551	060F	D8	4F	51	21
	20 33	1552	0610	D8	50	51	26
	20 34	1553	0611	D8	D1	51	4A
	20 35	1554	0612	D8	D2	51	4B
	20 36	1555	0613	D8	D3	51	4C
	20 37	1556	0614	D8	D4	51	4D
	20 38	1557	0615	D8	D5	51	4E
	20 39	1558	0616	D8	D6	51	4F
	20 40	1559	0617	D8	D7	51	50
	20 41	1560	0618	D8	D8	51	51
	20 42	1561	0619	D8	D9	51	52
	20 43	1562	061A	D8	5A	51	5D
	20 44	1563	061B	D8	5B	51	24
	20 45	1564	061C	D8	5C	51	2A
	20 46	1565	061D	D8	5D	51	29
	20 47	1566	061E	D8	5E	51	3B
	20 48	1567	061F	D8	5F	51	5E
	20 49	1568	0620	D8	60	51	2D
	20 50	1569	0621	D8	61	51	2F
	20 51	1570	0622	D8	E2	51	53
	20 52	1571	0623	D8	E3	51	54
	20 53	1572	0624	D8	E4	51	55
	20 54	1573	0625	D8	E5	51	56
	20 55	1574	0626	D8	E6	51	57
	20 56	1575	0627	D8	E7	51	58
	20 57	1576	0628	D8	E8	51	59
	20 58	1577	0629	D8	E9	51	5A
	20 59	1578	062A	D8	6A	51	7C
	20 60	1579	062B	D8	6B	51	2C
	20 61	1580	062C	D8	6C	51	25
	20 62	1581	062D	D8	6D	51	5F
	20 63	1582	062E	D8	6E	51	3E
	20 64	1583	062F	D8	6F	51	3F
	20 65	1584	0630	D8	F0	51	30
	20 66	1585	0631	D8	F1	51	31
	20 67	1586	0632	D8	F2	51	32
	20 68	1587	0633	D8	F3	51	33
	20 69	1588	0634	D8	F4	51	34
	20 70	1589	0635	D8	F5	51	35
	20 71	1590	0636	D8	F6	51	36
	20 72	1591	0637	D8	F7	51	37
	20 73	1592	0638	D8	F8	51	38
	20 74	1593	0639	D8	F9	51	39
	20 75	1594	063A	D8	7A	51	3A
	20 76	1595	063B	D8	7B	51	23
	20 77	1596	063C	D8	7C	51	40
	20 78	1597	063D	D8	7D	51	27
	20 79	1598	063E	D8	7E	51	3D
	20 80	1599	063F	D8	7F	51	22
	21 01	1600	0640	D9	40	52	20
	21 02	1601	0641	D9	C1	52	41
	21 03	1602	0642	D9	C2	52	42
	21 04	1603	0643	D9	C3	52	43
	21 05	1604	0644	D9	C4	52	44
	21 06	1605	0645	D9	C5	52	45
	21 07	1606	0646	D9	C6	52	46
	21 08	1607	0647	D9	C7	52	47
	21 09	1608	0648	D9	C8	52	48
	21 10	1609	0649	D9	C9	52	49
	21 11	1610	064A	D9	4A	52	5B
	21 12	1611	064B	D9	4B	52	2E

Mod 1 R C	Mods 2,3,4 R C	Position Dec	Position Hex	EBCDIC		ASCII	
	21 13	1612	064C	D9	4C	52	3C
	21 14	1613	064D	D9	4D	52	28
	21 15	1614	064E	D9	4E	52	2B
	21 16	1615	064F	D9	4F	52	21
	21 17	1616	0650	D9	50	52	26
	21 18	1617	0651	D9	D1	52	4A
	21 19	1618	0652	D9	D2	52	4B
	21 20	1619	0653	D9	D3	52	4C
	21 21	1620	0654	D9	D4	52	4D
	21 22	1621	0655	D9	D5	52	4E
	21 23	1622	0656	D9	D6	52	4F
	21 24	1623	0657	D9	D7	52	50
	21 25	1624	0658	D9	D8	52	51
	21 26	1625	0659	D9	D9	52	52
	21 27	1626	065A	D9	5A	52	5D
	21 28	1627	065B	D9	5B	52	24
	21 29	1628	065C	D9	5C	52	2A
	21 30	1629	065D	D9	5D	52	29
	21 31	1630	065E	D9	5E	52	3B
	21 32	1631	065F	D9	5F	52	5E
	21 33	1632	0660	D9	60	52	2D
	21 34	1633	0661	D9	61	52	2F
	21 35	1634	0662	D9	E2	52	53
	21 36	1635	0663	D9	E3	52	54
	21 37	1636	0664	D9	E4	52	55
	21 38	1637	0665	D9	E5	52	56
	21 39	1638	0666	D9	E6	52	57
	21 40	1639	0667	D9	E7	52	58
	21 41	1640	0668	D9	E8	52	59
	21 42	1641	0669	D9	E9	52	5A
	21 43	1642	066A	D9	6A	52	7C
	21 44	1643	066B	D9	6B	52	2C
	21 45	1644	066C	D9	6C	52	25
	21 46	1645	066D	D9	6D	52	5F
	21 47	1646	066E	D9	6E	52	3E
	21 48	1647	066F	D9	6F	52	3F
	21 49	1648	0670	D9	F0	52	30
	21 50	1649	0671	D9	F1	52	31
	21 51	1650	0672	D9	F2	52	32
	21 52	1651	0673	D9	F3	52	33
	21 53	1652	0674	D9	F4	52	34
	21 54	1653	0675	D9	F5	52	35
	21 55	1654	0676	D9	F6	52	36
	21 56	1655	0677	D9	F7	52	37
	21 57	1656	0678	D9	F8	52	38
	21 58	1657	0679	D9	F9	52	39
	21 59	1658	067A	D9	7A	52	3A
	21 60	1659	067B	D9	7B	52	23
	21 61	1660	067C	D9	7C	52	40
	21 62	1661	067D	D9	7D	52	27
	21 63	1662	067E	D9	7E	52	3D
	21 64	1663	067F	D9	7F	52	22
	21 65	1664	0680	5A	40	5D	20
	21 66	1665	0681	5A	C1	5D	41
	21 67	1666	0682	5A	C2	5D	42
	21 68	1667	0683	5A	C3	5D	43
	21 69	1668	0684	5A	C4	5D	44
	21 70	1669	0685	5A	C5	5D	45
	21 71	1670	0686	5A	C6	5D	46
	21 72	1671	0687	5A	C7	5D	47
	21 73	1672	0688	5A	C8	5D	48
	21 74	1673	0689	5A	C9	5D	49
	21 75	1674	068A	5A	4A	5D	5B
	21 76	1675	068B	5A	4B	5D	2E
	21 77	1676	068C	5A	4C	5D	3C
	21 78	1677	068D	5A	4D	5D	28
	21 79	1678	068E	5A	4E	5D	2B
	21 80	1679	068F	5A	4F	5D	21
	22 01	1680	0690	5A	50	5D	26
	22 02	1681	0691	5A	D1	5D	4A
	22 03	1682	0692	5A	D2	5D	4B
	22 04	1683	0693	5A	D3	5D	4C
	22 05	1684	0694	5A	D4	5D	4D
	22 06	1685	0695	5A	D5	5D	4E
	22 07	1686	0696	5A	D6	5D	4F
	22 08	1687	0697	5A	D7	5D	50
	22 09	1688	0698	5A	D8	5D	51
	22 10	1689	0699	5A	D9	5D	52
	22 11	1690	069A	5A	5A	5D	5D
	22 12	1691	069B	5A	5B	5D	24
	22 13	1692	069C	5A	5C	5D	2A
	22 14	1693	069D	5A	5D	5D	29
	22 15	1694	069E	5A	5E	5D	3B
	22 16	1695	069F	5A	5F	5D	5E
	22 17	1696	06A0	5A	60	5D	2D
	22 18	1697	06A1	5A	61	5D	2F
	22 19	1698	06A2	5A	E2	5D	53
	22 20	1699	06A3	5A	E3	5D	54
	22 21	1700	06A4	5A	E4	5D	55
	22 22	1701	06A5	5A	E5	5D	56
	22 23	1702	06A6	5A	E6	5D	57
	22 24	1703	06A7	5A	E7	5D	58
	22 25	1704	06A8	5A	E8	5D	59
	22 26	1705	06A9	5A	E9	5D	5A
	22 27	1706	06AA	5A	6A	5D	7C
	22 28	1707	06AB	5A	6B	5D	2C
	22 29	1708	06AC	5A	6C	5D	25
	22 30	1709	06AD	5A	6D	5D	5F
	22 31	1710	06AE	5A	6E	5D	3E
	22 32	1711	06AF	5A	6F	5D	3F
	22 33	1712	06B0	5A	F0	5D	30
	22 34	1713	06B1	5A	F1	5D	31
	22 35	1714	06B2	5A	F2	5D	32
	22 36	1715	06B3	5A	F3	5D	33
	22 37	1716	06B4	5A	F4	5D	34
	22 38	1717	06B5	5A	F5	5D	35
	22 39	1718	06B6	5A	F6	5D	36
	22 40	1719	06B7	5A	F7	5D	37
	22 41	1720	06B8	5A	F8	5D	38
	22 42	1721	06B9	5A	F9	5D	39
	22 43	1722	06BA	5A	7A	5D	3A
	22 44	1723	06BB	5A	7B	5D	23
	22 45	1724	06BC	5A	7C	5D	40
	22 46	1725	06BD	5A	7D	5D	27
	22 47	1726	06BE	5A	7E	5D	3D
	22 48	1727	06BF	5A	7F	5D	22
	22 49	1728	06C0	5B	40	24	20
	22 50	1729	06C1	5B	C1	24	41
	22 51	1730	06C2	5B	C2	24	42
	22 52	1731	06C3	5B	C3	24	43
	22 53	1732	06C4	5B	C4	24	44
	22 54	1733	06C5	5B	C5	24	45
	22 55	1734	06C6	5B	C6	24	46
	22 56	1735	06C7	5B	C7	24	47

Mod 1 R C	Mods 2,3,4 R C	Position Dec	Hex	Buffer Address (Hex) EBCDIC		ASCII		Mod 1 R C	Mods 2,3,4 R C	Position Dec	Hex	Buffer Address (Hex) EBCDIC		ASCII	
	22 57	1736	06C8	5B	C8	24	48		23 39	1798	0706	5C	C6	2A	46
	22 58	1737	06C9	5B	C9	24	49		23 40	1799	0707	5C	C7	2A	47
	22 59	1738	06CA	5B	4A	24	5B		23 41	1800	0708	5C	C8	2A	48
	22 60	1739	06CB	5B	4B	24	2E		23 42	1801	0709	5C	C9	2A	49
	22 61	1740	06CC	5B	4C	24	3C		23 43	1802	070A	5C	4A	2A	5B
	22 62	1741	06CD	5B	4D	24	28		23 44	1803	070B	5C	4B	2A	2E
	22 63	1742	06CE	5B	4E	24	2B		23 45	1804	070C	5C	4C	2A	3C
	22 64	1743	06CF	5B	4F	24	21		23 46	1805	070D	5C	4D	2A	28
	22 65	1744	06D0	5B	50	24	26		23 47	1806	070E	5C	4E	2A	2B
	22 66	1745	06D1	5B	D1	24	4A		23 48	1807	070F	5C	4F	2A	21
	22 67	1746	06D2	5B	D2	24	4B		23 49	1808	0710	5C	50	2A	26
	22 68	1747	06D3	5B	D3	24	4C		23 50	1809	0711	5C	D1	2A	4A
	22 69	1748	06D4	5B	D4	24	4D		23 51	1810	0712	5C	D2	2A	4B
	22 70	1749	06D5	5B	D5	24	4E		23 52	1811	0713	5C	D3	2A	4C
	22 71	1750	06D6	5B	D6	24	4F		23 53	1812	0714	5C	D4	2A	4D
	22 72	1751	06D7	5B	D7	24	50		23 54	1813	0715	5C	D5	2A	4E
	22 73	1752	06D8	5B	D8	24	51		23 55	1814	0716	5C	D6	2A	4F
	22 74	1753	06D9	5B	D9	24	52		23 56	1815	0717	5C	D7	2A	50
	22 75	1754	06DA	5B	5A	24	5D		23 57	1816	0718	5C	D8	2A	51
	22 76	1755	06DB	5B	5B	24	24		23 58	1817	0719	5C	D9	2A	52
	22 77	1756	06DC	5B	5C	24	2A		23 59	1818	071A	5C	5A	2A	5D
	22 78	1757	06DD	5B	5D	24	29		23 60	1819	071B	5C	5B	2A	24
	22 79	1758	06DE	5B	5E	24	3B		23 61	1820	071C	5C	5C	2A	2A
	22 80	1759	06DF	5B	5F	24	5E		23 62	1821	071D	5C	5D	2A	29
	23 01	1760	06E0	5B	60	24	2D		23 63	1822	071E	5C	5E	2A	3B
	23 02	1761	06E1	5B	61	24	2F		23 64	1823	071F	5C	5F	2A	5E
	23 03	1762	06E2	5B	E2	24	53		23 65	1824	0720	5C	60	2A	2D
	23 04	1763	06E3	5B	E3	24	54		23 66	1825	0721	5C	61	2A	2F
	23 05	1764	06E4	5B	E4	24	55		23 67	1826	0722	5C	E2	2A	53
	23 06	1765	06E5	5B	E5	24	56		23 68	1827	0723	5C	E3	2A	54
	23 07	1766	06E6	5B	E6	24	57		23 69	1828	0724	5C	E4	2A	55
	23 08	1767	06E7	5B	E7	24	58		23 70	1829	0725	5C	E5	2A	56
	23 09	1768	06E8	5B	E8	24	59		23 71	1830	0726	5C	E6	2A	57
	23 10	1769	06E9	5B	E9	24	5A		23 72	1831	0727	5C	E7	2A	58
	23 11	1770	06EA	5B	6A	24	7C		23 73	1832	0728	5C	E8	2A	59
	23 12	1771	06EB	5B	6B	24	2C		23 74	1833	0729	5C	E9	2A	5A
	23 13	1772	06EC	5B	6C	24	25		23 75	1834	072A	5C	6A	2A	7C
	23 14	1773	06ED	5B	6D	24	5F		23 76	1835	072B	5C	6B	2A	2C
	23 15	1774	06EE	5B	6E	24	3E		23 77	1836	072C	5C	6C	2A	25
	23 16	1775	06EF	5B	6F	24	3F		23 78	1837	072D	5C	6D	2A	5F
	23 17	1776	06F0	5B	F0	24	30		23 79	1838	072E	5C	6E	2A	3E
	23 18	1777	06F1	5B	F1	24	31		23 80	1839	072F	5C	6F	2A	3F
	23 19	1778	06F2	5B	F2	24	32		24 01	1840	0730	5C	F0	2A	30
	23 20	1779	06F3	5B	F3	24	33		24 02	1841	0731	5C	F1	2A	31
	23 21	1780	06F4	5B	F4	24	34		24 03	1842	0732	5C	F2	2A	32
	23 22	1781	06F5	5B	F5	24	35		24 04	1843	0733	5C	F3	2A	33
	23 23	1782	06F6	5B	F6	24	36		24 05	1844	0734	5C	F4	2A	34
	23 24	1783	06F7	5B	F7	24	37		24 06	1845	0735	5C	F5	2A	35
	23 25	1784	06F8	5B	F8	24	38		24 07	1846	0736	5C	F6	2A	36
	23 26	1785	06F9	5B	F9	24	39		24 08	1847	0737	5C	F7	2A	37
	23 27	1786	06FA	5B	7A	24	3A		24 09	1848	0738	5C	F8	2A	38
	23 28	1787	06FB	5B	7B	24	23		24 10	1849	0739	5C	F9	2A	39
	23 29	1788	06FC	5B	7C	24	40		24 11	1850	073A	5C	7A	2A	3A
	23 30	1789	06FD	5B	7D	24	27		24 12	1851	073B	5C	7B	2A	23
	23 31	1790	06FE	5B	7E	24	3D		24 13	1852	073C	5C	7C	2A	40
	23 32	1791	06FF	5B	7F	24	22		24 14	1853	073D	5C	7D	2A	27
	23 33	1792	0700	5C	40	2A	20		24 15	1854	073E	5C	7E	2A	3D
	23 34	1793	0701	5C	C1	2A	41		24 16	1855	073F	5C	7F	2A	22
	23 35	1794	0702	5C	C2	2A	42		24 17	1856	0740	5D	40	29	20
	23 36	1795	0703	5C	C3	2A	43		24 18	1857	0741	5D	C1	29	41
	23 37	1796	0704	5C	C4	2A	44		24 19	1858	0742	5D	C2	29	42
	23 38	1797	0705	5C	C5	2A	45		24 20	1859	0743	5D	C3	29	43

Mod 1 R C	Mods 2,3,4 R C	Position Dec Hex	Buffer Address (Hex) EBCDIC		ASCII		Mod 1 R C	Mods 2,3,4 R C	Position Dec Hex	Buffer Address (Hex) EBCDIC		ASCII	
	24 21	1860 0744	5D	C4	29	44		24 51	1890 0762	5D	E2	29	53
	24 22	1861 0745	5D	C5	29	45		24 52	1891 0763	5D	E3	29	54
	24 23	1862 0746	5D	C6	29	46		24 53	1892 0764	5D	E4	29	55
	24 24	1863 0747	5D	C7	29	47		24 54	1893 0765	5D	E5	29	56
	24 25	1864 0748	5D	C8	29	48		24 55	1894 0766	5D	E6	29	57
	24 26	1865 0749	5D	C9	29	49		24 56	1895 0767	5D	E7	29	58
	24 27	1866 074A	5D	4A	29	5B		24 57	1896 0768	5D	E8	29	59
	24 28	1867 074B	5D	4B	29	2E		24 58	1897 0769	5D	E9	29	5A
	24 29	1868 074C	5D	4C	29	3C		24 59	1898 076A	5D	6A	29	7C
	24 30	1869 074D	5D	4D	29	28		24 60	1899 076B	5D	6B	29	2C
	24 31	1870 074E	5D	4E	29	2B		24 61	1900 076C	5D	6C	29	25
	24 32	1871 074F	5D	4F	29	21		24 62	1901 076D	5D	6D	29	5F
	24 33	1872 0750	5D	50	29	26		24 63	1902 076E	5D	6E	29	3E
	24 34	1873 0751	5D	D1	29	4A		24 64	1903 076F	5D	6F	29	3F
	24 35	1874 0752	5D	D2	29	4B		24 65	1904 0770	5D	F0	29	30
	24 36	1875 0753	5D	D3	29	4C		24 66	1905 0771	5D	F1	29	31
	24 37	1876 0754	5D	D4	29	4D		24 67	1906 0772	5D	F2	29	32
	24 38	1877 0755	5D	D5	29	4E		24 68	1907 0773	5D	F3	29	33
	24 39	1878 0756	5D	D6	29	4F		24 69	1908 0774	5D	F4	29	34
	24 40	1879 0757	5D	D7	29	50		24 70	1909 0775	5D	F5	29	35
	24 41	1880 0758	5D	D8	29	51		24 71	1910 0776	5D	F6	29	36
	24 42	1881 0759	5D	D9	29	52		24 72	1911 0777	5D	F7	29	37
	24 43	1882 075A	5D	5A	29	5D		24 73	1912 0778	5D	F8	29	38
	24 44	1883 075B	5D	5B	29	24		24 74	1913 0779	5D	F9	29	39
	24 45	1884 075C	5D	5C	29	2A		24 75	1914 077A	5D	7A	29	3A
	24 46	1885 075D	5D	5D	29	29		24 76	1915 077B	5D	7B	29	23
	24 47	1886 075E	5D	5E	29	3B		24 77	1916 077C	5D	7C	29	40
	24 48	1887 075F	5D	5F	29	5E		24 78	1917 077D	5D	7D	29	27
	24 49	1888 0760	5D	60	29	2D		24 79	1918 077E	5D	7E	29	3D
	24 50	1889 0761	5D	61	29	2F		24 80	1919 077F	5D	7F	29	22

Appendix C. Status Indicator Codes

STATUS INDICATOR CODE	NAME	ALARM **	DISPLAY/PRINTER ADAPTER ATTACHMENT
01	End of Form	X	X
07*	Received Invalid Order	X	X
08	Hold Print Timeout (10 minutes)		X
09	Operator Check (Operation Invalid)		X
27*	Subsystem Not Ready or Bad Cable		X
31	End of Form Timeout (60 seconds)		X
41*	Wire Fire Check	X	X
42*	Printed Not Ready	X	X
43*	Form Feed Error	X	X
44*	Emitter Check	X	X
45*	Emitter Sequence Error	X	X
46*	Carrier Timer Overflow	X	X
47*	Carrier Drive Error	X	X
50*	Selector Switch Error	X	X
51*	Data Count Error	X	X
52*	Internal Timeout	X	X
59	Cancel Selected		X
61	PA 1 Selected		X
62	PA 2 Selected		X
63	Printer in Send State	X	X
67	Buffer Reprint		X
81			X
82			X
83			X
84			X
85			X
86			X
87	Internal Parity or CU Communication Error		X
88			X
89			X
90			X
91			X
92			X
94			X
99	Invalid Diagnostic Section Selected (Feature Support)		X

*   Reset with the reset switch.

* *   Alarm will be repetitively sounded for these status indicator
codes and the Alarm Poll and SCS Bell commands.
Alarm will be turned off by pressing the Hold Print switch.

Figure C-1. 3287 Printer Status Indicator Codes

Appendix D. Katakana Feature

This appendix contains Katakana unique information interface codes and the keyboard shift operations.

Interface Codes

Figure D-1 on page D-2 , shows the Japanese Katakana EBCDIC interface codes for displays and terminal printers. It corresponds to Figure 2-1 on page 2-3, Figure 2-2 on page 2-4 , Figure 2-3 on page 2-6 , respectively.

Keyboard Shift Operations

The Katakana keyboards shift operations are different from the other EBCDIC keyboards described in Chapter 3. The following paragraphs discuss the unique keys and operations.

Four shifts [upper and lower left (UL and LL) and upper and lower right (UR and LR)] on the Katakana keyboards are used with the displays:

Shift	Typewriter Keyboard		Data Entry Keyboard		Operator Message
UL	禾 12§	Alpha Symbol	ᄀ/ᄀ	Alpha Symbol Numeric	ALPHA ⇧
LL	禾 !!	Alphanumeric	禾 ヲ	Alpha	ALPHA
UR	カ ア 12§	KANA Symbol	カ ア 12§	KANA Symbol	カ ア ⇧
LR	カ ア	Katakana	カ ア	Katakana	カ ア

The characters associated with each shift level are shown in the corresponding position of the key tops. In normal operation, the appropriate shift key is pressed and released to enter the required shift level; the keyboard remains in that shift level until another is selected. However, in a programmed numeric field (program attribute), the keyboard is automatically set to the upper left (UL) shift, and all characters for that shift are valid, unless a keyboard with the numeric lock feature is being used. The numeric lock feature limits the entries to 0-9, minus (-), decimal sign, and DUP. This automatic UL shift may be overridden by pressing and holding the desired shift key; releasing the shift key returns the keyboard to the UL shift.

Note: After a screen update (for instance WRITE, and/or changing of cursor position or attribute characters) the shift indicator reflects the shift status before the update. The shift indicator and shift mode will be adapted with the first, subsequent keystroke.

Figure showing Katakana EBCDIC I/O Interface Code chart.

Bits 4567	Hex 1	00				01				10				11				← Bits 0,1
		00	01	10	11	00	01	10	11	00	01	10	11	00	01	10	11	← Bits 2,3
		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	← Hex 0
0000	0	NUL				SP	&	—			ソ					$	0
0001	1		SBA			॰	エ	/		ア	タ	—		A	J		1
0010	2		EUA			┌	ォ			イ	チ	ヘ		B	K	S	2
0011	3		IC			┘	Þ			ウ	ツ	ホ		C	L	T	3
0100	4					＼	ユ			エ	テ	マ		D	M	U	4
0101	5	PT	NL			・	ヨ			オ	ト	三		E	N	V	5
0110	6					ヲ	ッ			カ	ナ	ム		F	O	W	6
0111	7					ァ				キ	ニ	メ		G	P	X	7
1000	8					ィ	—			ク	ヌ	モ		H	Q	Y	8
1001	9		EM			ゥ				ケ	ネ	Þ		I	R	Z	9
1010	A					£	!		:	コ	ノ	ユ	レ				
1011	B					.	¥	,	#				ロ				
1100	C	FF	DUP		RA	<	*	%	@	サ		ヨ	ワ				
1101	D	CR	SF			(	)	_	'	シ	ハ	ラ	ン				
1110	E		FM			+	;	>	=	ス	ヒ	リ	ﾞ				
1111	F					|	¬	?	"	セ	フ	ル	ﾟ				

Note: Character code assignment other than those shown within the heavily outlined portions of this chart are undefined; IBM reserves the right to change at any time the character displayed or printed for any undefined character code.

Figure D-1. Katakana EBCDIC I/O Interface Codes for Terminal Printers and Displays

Appendix E. Color Information

Automatic Convergence Mode

The color feature will be activated during the IPL process when a Device Reset sequence is sent to all natively attached terminals in port-ascending order. This Device Reset starts the automatic convergence for each display if the display is configured as a 3279.

If the operator console is in MAN-OP mode, as well as in case of overlapping requests for automatic convergence (by Device Reset from other 3279.s), queuing and unstacking in Display/Printer Adapter port priority order is done. This implies that color convergence can occur asynchronously to the standard device reset sequence.

The automatic convergence mode is terminated when the color convergence requests (including the queued ones) are satisfied. As long as the automatic color convergence is not done, the Local Copy key and TEST key are inoperative. Pressing these keys will display xc-f.

Manual Convergence Mode

This mode is entered by using online test 7 whenever the settings of the three primary colors (red, green, blue) have to be optimized to produce a pure, compound color.

As long as a 3279 is in manual convergence mode, no other 3279 will have access to the manual convergence routine. Requesting Test 7 from other 3279 will display xc-f in this case. The operator at the system console will be informed that another display is using the color convergence routine by displaying the message 'CONVERGENCE ON PORT nn'. The color convergence routine can be terminated in four ways. They are:

- Leaving TEST mode.

- Leaving TEST 7.

- Power Off/On the display.

- By the system console operator.

If the Test 7 is terminated by the system console operator, the Test 7 pattern disappears, the WAIT symbol is displayed and the cursor is displayed in the left, upper corner of the screen. The adjustments made so far are saved. The display remains in TEST mode. The color convergence adjustment should be attempted again after a few minutes. Manual Convergence cannot be done on color display stations which have a '-1' at the end of their terminal number (for instance, 3279 S2A-1).

There are six tests available to test the devices connected to the Display/Printer Adapter:

- Test 0 checks the communication path between the Display/Printer Adapter and its attached devices. It also provides functional testing of type A devices.

- Test 1 displays error statistics for displays, printers and Display/Printer Adapter. This test is for service personnel use only.

- Test 2 is not available.

- Test 3 displays the status (off, on, or disabled) for all configured devices.

- Test 4 resets logs. For service personnel use only.

- Test 5 is not available.

- Test 6 displays the device control blocks and Display/Printer Adapter control block. For service personnel use only.

- Test 7. Color convergence procedure.

These tests can be executed concurrently with normal system operation for all devices attached to ports 1 - 7(15).

When the system is in MAN-OP state, or someone is pressing any key which is, not required for TEST operation, or when an invalid TEST function (for instance Test 6 for a not configured device) is requested, the symbol xc-f is displayed.

For requesting and using tests refer to respective I/O device documentation.

Machine Check Indicator

Symbol	Explanation
✗ ↘ 228	The keyboard is locked. If the keyboard can be reset, the battery has failed. The terminal can be used if the keyboard can be reset. Action: Replace the battery. If the keyboard cannot be reset, the color convergence circuitry has failed. The terminal is disabled. At the affected terminal, switch the Normal/Test from Normal to Test and back again, or switch power off, then on.
Symbol	Explanation
✗ ↘ 229	The color convergence storage failed during a power on sequence or execution of Test 7. The terminal is not enabled or the keyboard is inhibited. At the affected terminal, switch the Normal/Test switch from Normal to Test and back again, or switch Power off, then on. If the affected terminal is a 3278, inform the system operator

to have the configuration changed by authorized personnel.

Attribute Character   Some Attribute Character Bits as described in Figure 3-3 on page 3-4 have a double function as shown below.

Bit Assignment

Bit	2	4	5	Base color switch set to 0000	Base color switch set to 00
	0	0	X	Green	Green
	1	0	X	Blue	Green
	0	1	0	Red	White
	1	1	0	White	White
	X	1	1	Non-display	

X = ignored

List of Abbreviations

A	Attention		Ctl	control
ACK	positive acknowledge		CU	control unit
AID	Attention Identification		CUE	Control Unit End
ALPHA	alphameric		D	display
A/N	alphameric/numeric		DAA	data access arrangement
APL	a programming language		DB	Device Busy
ASCII	American Standard Code for Information Interchange		DC	Data Check
			DE	Device End
Async	asynchronous		Dec	decimal
Atb	attribute		DEL	delete
B	Busy		DISC	disconnect
BB	begin bracket		DLE	data link escape
BCC	block check character		DR	definite response
BIU	basic information unit		DUP	duplicate
BOC	bus out check		EAU	Erase All Unprotected
bps	bits per second		EBCDIC	Extended Binary-Coded-Decimal Interchange Code
BSC	Binary Synchronous Communications			
BETB	between bracket state		EB	end brackets
C	column		EC	Equipment Check
CAW	channel address word		EFI	expedited flow indicator
CC	control check		EIA	Electronic Industries Association
CC (flag)	Chain Command		EM	end of message
CCC	copy control character		ENP	Enable Presentation
CCW	channel control word		ENQ	enquiry
CD	change direction		EOF	End of Field
CE	Channel End		EOI	End of Inquiry
char	character		EOR	End of Record
Cmd	command		EOT	End of Transmission
CNCL	cancel		ERP	error recovery procedure(s)
s	characters per second		ESC	escape
CPU	central processing unit		ETB	End of Transmission Block
CR	Carriage Return		ETX	End of Text
CRT	cathod-ray tube		EUA	Erase Unprotected to Address
CSW	channel status word			

EX (response)	exception	P	printer, protected
FF	forms feed	PA	program access
FID	format identifier	PF	program function
FIE	function interpret error	PLU	primary logical unit
FM	field mark	PSI	primary to secondary indicator
FM	function management	PT	Program Tab
GP	General Poll	R	row
Hex	hexadecimal	RA	Repeat to Address
HT	Horizontal Tab	RB	Read Buffer
Hz	Hertz	RBM	Read Buffer Modified
I (format)	information	Rd Mod	Read Modified
IC	Insert Cursor	Req	request
Ident	identification	ROL	request online
IML	initial machine load	RH	request/response header
Ind	indicator	RM	Read Modified
INS	insert	RNR	request not ready
IOS	Input/Output Supervisor	R/R	request/response
IR	Intervention Required	RR	request ready
ITB	end of intermediate transmission block	RTS	request to send
kbd	keyboard	RU	request response unit
LF	line feed	RVI	reverse interrupt
LIC	last in chain	S (format)	sequenced
LRC	longitudinal redundancy check	SA	selection addressing
LU/SSCP	logical unit/system services control point	SBA	Set Buffer Address
MDT	modified data tag	SDLC	synchronous data link control
MPP	maximum presentation position	SF	Start Field
MSR	Magnetic Slot Reader	SHF	Set Horizontal Format
NA or N/A	not applicable	SI	Suppress Index
NAK	negative acknowledge	SIOF	Start I/O Fast Release
NCP	network control program	SLU	secondary logical unit
NL	New Line	SM	Status Modifier
NS (format)	non-sequenced	SNA	systems network architecture
NSA	non-sequenced acknowledgment	SNBU	switched network backup
NUL	null	SNRM	set normal response mode
OC	Operation Check	SOH	start of heading

SOR	start of record	TH	transmission header
SP	space, Specific Poll	TTD	temporary text delay
SPD	selector pen detect	U	unprotected
SSCP	system services control point	UC	Unit Check
S/S	status and sense	UE	Unit Exception
STX	start of text	US	Unit Specify
SUB	substitute	V	volts
SVF	Set Vertical Format	VFC	vertical forms control
Sw	switch	VTAM	Virtual Telecommunications Access Method
SYN	synchronous idle		
TC	Transmission Check	WACK	wait before transmit
TCU	transmission control unit	WCC	write control character

Glossary

Terms in this glossary are defined here as they apply to the 4361 Processor.

alphameric field. A field that may contain any alphabetic, numeric, or special character that is available on 3270 keyboards.

alphameric keyboard. A typewriter-like keyboard used to enter letters, numbers, and special characters into a display station buffer; also used to perform special functions (such as backspacing) and to produce special control signals.

attention. An I/O interruption generated asynchronously by a display station, usually as the result of an action taken by the operator of the device.

attention identification (AID) character. A code that is set in the display station when the operator takes an action that produces an I/O interruption. The character identifies the action or key that caused the condition to be generated. The AID is set when the display station operator presses a program access key, when a Selector Light-Pen attention occurs, or when a successful magnetic card read-in occurs. It also identifies device addresses assigned to printers.

attribute. A characteristic of a display field. The attributes of a display field include: protected or unprotected (against manual input and copy operations); numeric-only or alphameric input control; displayed, non-displayed, display-intensified; selector-pen-detectable or -non-detectable; and modified or not modified.

attribute character. A code that defines the attributes of the display field that follows. An attribute character is the first character in a display field, but it is not a displayable character.

audible alarm. A special feature that causes a short, audible tone to be sounded automatically when a character is entered from the keyboard into the next-to-last character position on the screen. It can also be sounded under program control.

automatic skip. Automatic repositioning of the cursor, after entry of a character into the last character position of an unprotected display field, over a protected and numeric field to the first character position of the next unprotected display field.

automatic upshift. Automatic shift of the data-entry keyboard, when the cursor enters an unprotected numeric field to allow entry of only the upper symbols on dual-character keys.

available/unavailable. A device is available for CU-channel operation if (1) ac power is on at the device, (2) it is online, (3) it is physically attached to the CU, and (4) its security lock is turned on. The device is unavailable if any one of these conditions does not exist.

buffer. The hardware portion of a display station, control unit, or buffered printer in which display or print data is stored.

buffer address. The address of a location in the buffer at which one character can be stored.

busy/not busy. The CU considers a device busy if (1) it is performing an operation that was initiated by the CU (namely, an

erase-all-unprotected operation or a printing operation) or (2) if the CU attempted to perform a command with the device but found the device busy executing a manually initiated operation. A manual operation can be initiated at the keyboard, operator identification card reader, or selector pen.

cathod-ray tube (CRT). A vacuum tube in which a slender beam of electrons is projected upon a fluorescent screen to produce a luminous glow corresponding to the beam's path.

character addressing. The capability of gaining access to any character position in the buffer by using an address.

character generator. A hardware unit contained in each 3270 display and printer. It converts the digital code for a character into signals that cause the character to be printed or displayed.

character position. A location on the screen at which one character can be displayed; also, an addressed location in the buffer at which one character can be stored.

copy control character (CCC). A character used in conjunction with the Copy command to specify that a particular operation or combination of operations, is to be performed at a display station or printer in the data that is to be copied.

copy operation. An operation that copies the contents of the buffer from one display station or printer to another display station or printer attached to the same control unit.

cursor. A unique symbol (an underscore or rectangular symbol) that identifies a character position in a screen display, usually the character position at which the next character to be entered from the keyboard will be displayed.

cursor check. An error condition that occurs when display station circuitry detects no cursor or more than one cursor in the display buffer.

data-entry keyboard. A typewriter keyboard on which the numeric keys are grouped in a format similar to the numeric keys on a card punch keyboard (to facilitate entry of numeric data). Other features include (1) automatic upshift of the keyboard when the cursor enters a numeric-only display field and (2) automatic prevention of entry of non-numeric characters into a numeric-only display field, when the special Numeric Lock feature is installed.

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

designator character. A character that immediately follows the attribute character in a selector-light-pen-detectable field. The designator character controls whether a detect on the field will or will not cause an attention. For a non-attention-producing field, the designator character also determines whether the modified data tag for the field is to be set or reset as the result of selector light-pen detect.

detectable. An attribute of a display field; determines whether the field can be sensed by the selector light-pen.

display field. A group of consecutive characters (in the buffer) that starts with an attribute character (defining the characteristics of the field) and contains one or more alphameric characters. The field continues to, but does not include, the next attribute character.

display operator. A person who uses the keyboard to perform operations at a display station.

escape command sequence. A two-character sequence used in remote operations that consists of ESC (27 hex in EBCDIC and 1B hex in ASCII) and the command character which follows and specifies the 3270 command.

formatted display. A screen display in which a display field, or fields, has been defined as the result of storing at least one attribute character in the display buffer.

input field. An unprotected field in which data can be entered, modified, or erased manually.

intensified display. An attribute or a display field; causes data in that field to be displayed at a brighter level than other data displayed on the screen.

I/O pending. The condition that results in generation of the attention status in a locally attached display station and results in a response to a polling operation in a remotely attached display station.

keyboard numeric lock. A special feature which allows entry of 0-9, minus (-), period (.), or DUP only; otherwise, the keyboard will be disabled.

modified data tab (MDT). A bit in the attribute character of a display field, which, when set, causes that field to be transferred to the channel during a read-modified operation. The modified data tag may be set by (1) a keyboard input to the field, (2) a selector-pen detection in the field, (3) a card read-in operation, or (4) program control. The modified data tag may be reset by (1) a selector-pen detection in the field, (2) program control, or (3) ERASE INPUT key.

multidrop. A line or circuit interconnecting several stations; synonymous with multipoint line.

null character. An all binary-0 character that occupies a position in the storage buffer and is displayed as a blank position.

null suppression. In reading the contents of the buffer for a display or printer, the bypassing of all null characters in order to reduce the amount of data to be transmitted or printed.

order code. A code that may be included in the write data stream transmitted for a display station or printer; provides additional formatting or definition of the write data.

order sequence. A sequence in the data stream that starts with an order code and includes a character address and/or data characters related to the order code.

parity check. An error condition that occurs when the Display/Printer Adapter circuitry detects one or more characters with bad parity in a unit buffer.

program access (PA) key. A program attention key that may be defined to solicit program action that does not require data to be read from the buffer of the display station. If a Read Modified command is issued in response to the program attention key interruption, only the attention identification (AID) character is transferred to the program; no data from the buffer is transferred.

program attention key. Any key on the keyboard that solicits program action by generating an I/O interruption. The keys are the CLEAR key, ENTER key, TEST REQ key, CNCL key, program function keys, and program access keys. Each program attention key is associated with a unique attention identification (AID) character.

program function (PF) key. A program attention key that may be defined to solicit program action that usually requires data to be read from the buffer of the display station. If a Read Modified command is issued in response to the program function key interruption, the attention identification (AID) character and all display fields in which the modified data tags are set are transferred to the program.

protected field. A display field for which the display operator cannot use the keyboard or operator identification card reader to enter, modify, or erase data.

read-modified operation. An operation in which only those display fields in which the modified data tag is set are read.

ready/not ready. The only devices that can be "not ready" are the attached printers. Thus, a printer is not ready to operate with the CU when (1) the printer's cover is open, (2) it is out of paper, or (3) a "hang" condition exists in the printer.

security key lock. A special feature that disables all input functions and blanks the display, except when the key is inserted in the lock and turned.

short read. A Read Modified command sent in reply to depression of the CLEAR CNCL, or a PA key at a display station. Only an AID byte is transferred to main storage.

structured data 6-bit. The low-order 6 bit binary coded characters used internally by the CU. The 6-bit code is applicable to all characters received by the CU: graphic, AID, attribute, write control (WCC), copy control (CCC), CU and device address, buffer address, status and sense.

test request read. A Read Modified command resulting from the operator pressing the TEST REQ or SYS REQ key to allow entry of a predefined test request data format.

unformatted display. A screen display in which no attribute character (and, therefore, no display field) has been defined.

unprotected field. A display field for which the display station operator can manually enter, modify, or erase data.

wraparound. The continuation of an operation (for example, a read operation or a cursor movement operation) from the last character position in a buffer to the first character position in the buffer.

write control character (WCC). A character used in conjunction with a write-type command to specify that a particular operation or combination of operations, is to be performed at a display station or printer.

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