

DM3270
DM3270

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TECHNICAL USER MANUAL

Control Unit Display Station



BEEHIVE INTERNATIONAL

MODEL DM3270

**"enhanced
emulation"
IBM 3276-2 type
stand-alone
control unit
display station**

TECHNICAL USER MANUAL

January 1982

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Another Terminal from

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SECTION I SPECIFICATIONS

1.1 INTRODUCTION

This manual contains setup and operating instructions for the DM3270 terminal. The DM3270 Control Unit Display Station is a 8085A microprocessor-controlled emulator of the IBM 3276* Model 2 Control Unit Display Station. The DM3270 provides the major functional capabilities of the original IBM component. This manual is divided into three sections:

Section I - provides a specification sheet and introduction for general terminal information.

Section II - describes the installation, interface, and initial checkout of the terminal.

Section III - describes to the operator the operational characteristics and functions of the terminal.

The screen display is organized with 24 lines of 80 characters each (1920 characters). The standard set of 3276

field and visual attributes is provided as well as *Extended Highlighting Features* found in the IBM 3279: reverse video, field blink, and underline. The 25th line is provided for a status line which provides the operator with updated information on operating modes, error messages, and communications.

The keyboard is an 87 key IBM EBCDIC typewriter style, similar to the IBM 462X series with extended features, and a numeric pad (see Figure 1-1). Program function keys 13 through 24 are invoked in the alter mode rather than the standard mode as with the IBM 3276. Keyboard features include typamatic operation, and two-key rollover. Individual field selection is provided through the CURSR SEL key. The monospace display feature (known herein as lower case inhibit) is provided in a modified form.

The controller portion of the display station appears to the mainframe/host as an IBM 3287 Model 1 printer, thereby making the terminal compatible with existing mainframe and applications programs. The controller also provides the translation required to allow the use of an ASCII printer which utilizes an RS232C type interface.

*May be a registered trademark of IBM

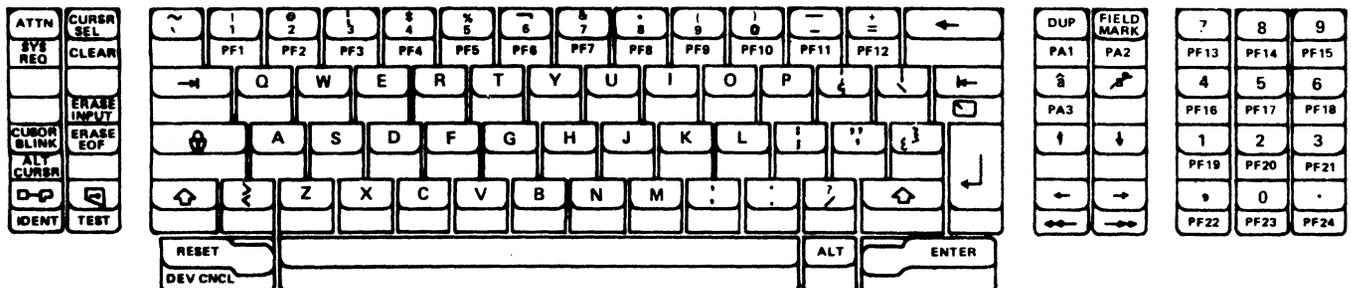


Figure 1-1 DM3270 Keyboard Layout

Table 1-1 DM3270 Specifications

Display Format

24 X 80 characters

Display Memory

24 lines of 80 characters

Status Line

25th line of the display

CRT Size

12" measured diagonally

Phosphor

Green, P42, bonded

Character Size

Approximately 0.2" high X 0.1" wide

Character Type (Alphameric)

128 displayable characters, each formed within an 6 X 7 matrix within an 8 X 10 cell. Descenders on lower case characters are provided.

Character Generation

MOS ROM

Refresh Rate

50/60 Hz (switch selectable)

Refresh Memory

MOS RAM

Character Display

Light characters or a dark background

Visual Attributes

Normal, bright, and security intensity

Logical Attributes

alphameric, numeric only, protected, auto-skip, and a substitute feature for the light pen, using the cursor location and the CURSR SEL key.

Extended Highlight Features

Reverse Video
Field Blink
Underline

Cursor

Nondestructive block or underline, blinking or nonblinking (selected by keyboard entry)

Cursor Control

Up, down, left, right, Home, new line, tab, backtab, fast scan, left and right

Editing Operations

Insert/delete character

Erase Functions

Erase to end-of-field, erase variable data, and erase screen

Serial Printer Interfaces

No Printer attached
Pin 11/19=Ready
Pin 11/19=Busy
Pin 11/19=Reverse Channel
ETX/ACK
XON/OFF
ACK/NAK
TTY

Communications Interface

Serial RS232C

Transmission Rate

Determined by modem, up to 9600 baud

Communications Mode

Synchronous half duplex (over leased or dial up lines)

Communications Code

EBCDIC

Communications Protocol

Binary Synchronous (BSC)

Modem Compatibility

Compatible with a wide range of modem types.
(Bell* 201, 208, 209)

Indicators

All INDICATORS will be provided via the status line, (see Figure 3-1).

Bell

Audible alarm upon invalid keyboard entry and audible click upon key entry when selected.

Keyboard

A detachable keyboard with 87 keys, including a numeric pad, cursor control keys, edit keys, shift lock, 24 program function keys, and 3 program access keys.

Self-Test

Initiated by operator command and upon powerup. Extensively tests the terminal.

Monitor Mode

Data link analyzer displays all codes (see Figure 3-2).

Input Voltage and Frequency

115 VAC + -10% @ 60Hz
230 VAC + -10% @ 50Hz

Environmental Specifications

Altitude: 0 to 10,000 feet
Temperature: 0 to 40 degrees C
Humidity: 0 to 80% (noncondensing)

Terminal Size

Monitor:	16.5" (41.9cm) deep X 18.2" (46.2cm) wide X 13.1" (33.3cm) high
Keyboard:	9.1" (23.1cm) deep X 19.4" (49.3cm) wide X 2.9" (7.4cm) high
Combined:	25.5" (64.7cm) deep X 19.25 (48.9cm) wide X 13.1" (33.3cm) high
Keyboard Cable Length:	2 feet (.61 meters)

Terminal Weight

Monitor:	34 lbs.
Keyboard:	4 lbs.
Total:	38 lbs.
Shipping Weight:	50 lbs.

IBM Features Not Supported

Security Keylock
Magnetic Read Control
APL and Data Entry Keyboards
Numeric Lock
Terminal Clustering
Multiple Printers and the Authorization Rating
3276 Dial Operation
Nonbuffered Print
14 Bit Buffer Addressing
SNA Protocol
Integrated Modems

* May be a registered trademark

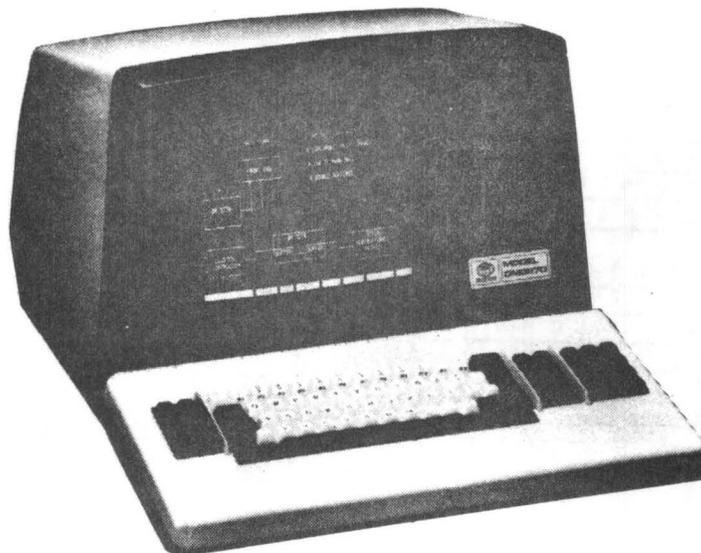


Figure 1-2 DM3270 Terminal

SECTION II INSTALLATION

2.1 INTRODUCTION

This section contains information on unpacking, receiving/inspection, connection of the communications interface, physical placement of the terminal, and functional control settings for specific user requirements.

2.2 UNPACKING

The following items are furnished with each DM3270 terminal:

- a. The display terminal with detachable keyboard.
- b. Technical User Manual.
- c. Warranty return card and a manual order form blank.

There are no tie-downs or packing materials inside the plastic cover that need to be removed.

2.3 INSPECTION FOR IN-SHIPMENT DAMAGE

All Beehive terminals are packed in material designed to withstand normal handling in transit. Mishandling should be evident upon inspection of the shipping container. If evidence of excessive moisture, heat or physical damage is observed on the exterior of the shipping container, be careful to inspect the terminal for any irregularities immediately so that a claim can be filed with the carrier. Save all evidence (including the shipping container), document the damage with photographs. Save the container and packing material for any future shipping which may be necessary.

2.4 IDENTIFICATION

An identification plate is located on the rear of the terminal and provides the model number, part number, serial number, weight, voltage/current requirements, and frequency/power classifications.

2.5 INSTALLATION

2.5.1 Placement for Operation

The terminal is fully self-contained except for the AC power source and appropriate I/O cables (terminal to modem and/or terminal to printer) making it very easy to install or move. Select a convenient, level surface where the cables are not in the way of the operator and are not inadvertently pulled or disturbed by minor changes in the terminal's position. The keyboard should be placed so that operator use is as comfortable as possible.

CAUTION: Do not place the terminal on any surface that blocks cooling air from the back of the cabinet. The terminal has an internal fan for cooling which circulates air through a grille in the back and to spacing at the bottom sides between the cover and terminal frame. To maintain efficient air circulation, keep at least three-and-one-half inches of clearance at the rear and sides of the terminal (see Figure 2-1).

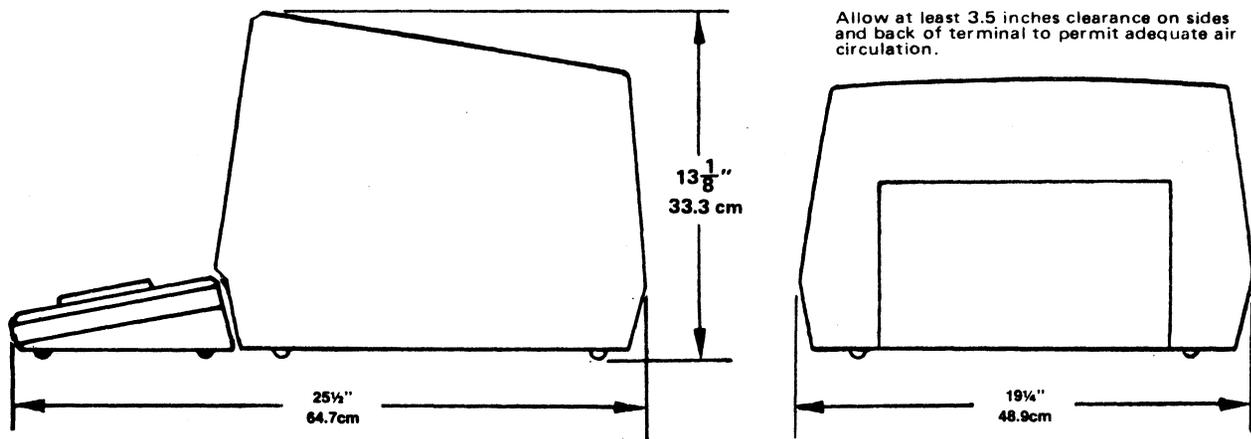


Figure 2-1 Mounting Requirements

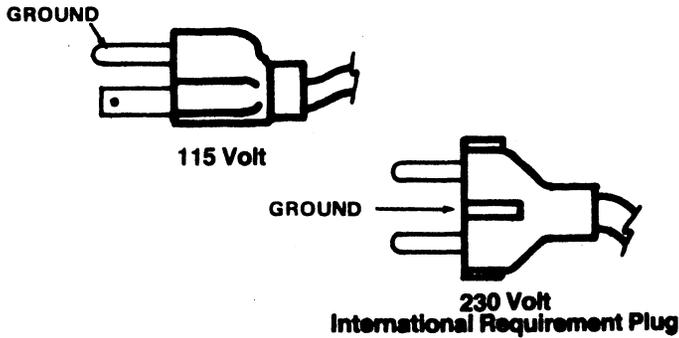


Figure 2-2 AC Power and Ground Connectors

2.5.2 AC Power Connection

The terminal is shipped with either a 115 or 230 volt power cord and a corresponding internal power transformer configuration. Your AC power outlet must supply a voltage within $\pm 10\%$ of 115 or 230 volts (whichever is configured) for proper operation.

The grounding conductors indicated in Figure 2-2 provide important electrical connections which should always be preserved by plugging the terminal into a properly grounded outlet or adapter. Grounding is *vital* not only from an operator safety standpoint, but also to suppress radio frequency/electromagnetic interference (RFI/EMI) and drain off static electricity charges which may accumulate and impair data integrity.

Any extension cord used to provide power to the terminal must be three wire type which preserves grounding integrity. Its wire size must be sufficient to insure adherence to local electrical codes.

Table 2-1 Main Port Pin Assignments

PIN NO.	RS232C	DESCR.	SIGNAL DIRECTION	ASSIGNMENTS
1	AA	Frame Ground	-	Chassis ground; electrically bonded to frame.
2	BA	Transmit Data	DM → Data Set	Pin 2 will be in the mark condition with no output signal
3	BB	Receive Data	DM ← Data Set	Data from host
4	CA	Request to Send	DM → Data Set	Goes hi during transmission; drops lo upon completion.
5	CP	Clear to Send	DM ← Data Set	When hi, transmission is enabled. When held lo, transmission is disabled.
6	CC	Data Set Ready	DM ← Data Set	Indicates the modem is ready.
7	AB	Signal Ground	-	Same potential as chassis ground (pin 1).
15	DB	Transmit Clock	DM ← Data Set	X1 Transmission clock from modem.
17	DD	Receive Clock	DM ← Data Set	X1 Receive Clock from modem.
20	CD	Data Terminal Ready	DM → Data Set	Held hi when the terminal is ready.

2.5.3 Data Interface Connection

Signals used in communicating with the DM3270 conform to the requirements of EIA specification RS232C. In particular, output voltages swing from $-10V$ to $+10V$, while the receivers present a minimum of 3k ohms impedance to the line. The input resistance is approximately 4k ohms. The driver circuits have a current limit of 10 mA on both source and sink. All data source interconnections are made via the rear panel input/output connector (see Figure 2-3). A 25-pin miniature D-type ITT Cannon connector (DM-25S or equivalent) is used for connection to the computer. Pin assignments are defined in Tables 2-1 and 2-2. The communications line from the modem connects to the *main port* and the printer connects to the *AUX port (printer port)*.

Table 2-2 Printer Port Pin Assignments

PIN NO.	RS232C	DESCR.	SIGNAL DIRECTION	ASSIGNMENTS
1	AA	Frame Ground	-	Chassis ground; electrically bonded to frame.
2	BA	Receive Data	DM ← Printer	Data received from printer.
3	BB	Transmit Data	DM → Printer	Data output to printer.
4	CA	Request to Send	DM ← Printer	Ignored by DM3270
5	CB	Clear to Send	DM → Printer	Remains hi at all times.
6	CC	Data Set Ready	DM → Printer	Remains hi at all times.
7	AB	Signal Ground	-	Same potential as pin 1.
8	CF	Carrier Detect	DM → Printer	Remains hi at all times.
11		Printer Not Busy	DM ← Printer	When hi, printer can receive data. When lo, printer is busy.
19		Printer Not Busy	DM ← Printer	Same as Pin 11
20	CD	Data Terminal Ready	DM ← Printer	When hi, printer is online. When lo, printer is offline.

2.5.4 PC Board-Mounted Control Switches

Three switch blocks are mounted on the printed circuit board. Two are located at the rear of the board and are accessible for resetting through an external opening. The other switch block is located near the left rear corner of the board and can be reached by removing the cover. These switches are illustrated in Figure 2-3.

2.6 INITIAL TURN-ON PROCEDURE

The proper turn on procedure for the terminal is described in Subhead 3.1.2.

2.7 REAR PANEL SWITCH USE

The operating configuration of the DM3270 is defined by rear panel and internal switch positions as described in

Figure 2-3 and the remainder of this subsection.

2.7.1 LCI - Lower Case Inhibit S1-1

When LCI is *not* selected (S1-1 down), alpha characters are displayed in upper and lower case just as they are entered in the display buffer. When LCI is selected (S1-1 up), all lower case character codes are entered and displayed upper case characters. Changing the switch setting only affects data entered into the display buffer after the switch as been changed. Data already displayed is not affected.

2.7.2 Setting Up Contention Protocol (Point-to-Point)*

The terminal may be configured in a contention protocol or point-to-point mode (switched line, dial up). This protocol allows the host to interact, by specific address, with up to 128 terminals. Set the rear panel switches as follows:

1. Set switch 4 of the internal switch block 3 (S3) to the "on" position (see Figure 2.3).
2. To set the terminal address, use the following chart and set switches 2 through 8 on external switch S1 to reflect the desired 3 digit terminal I.D. number.

Table 2-3 Contention Protocol (point-to-point)

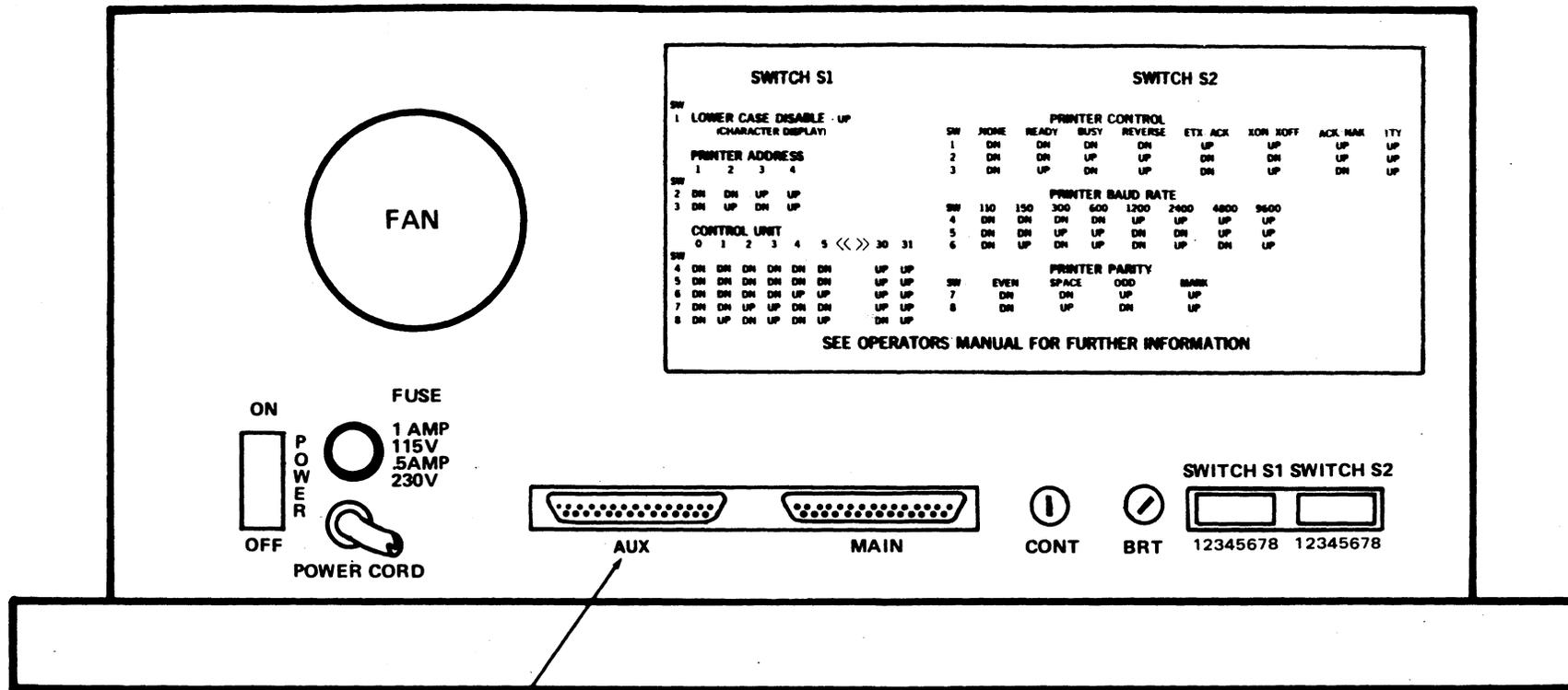
TERMINAL I.D. NUMBER	SWITCH NUMBERS						
	2	3	4	5	6	7	8
000	OFF	OFF	OFF	OFF	OFF	OFF	OFF
001	OFF	OFF	OFF	OFF	OFF	OFF	ON
002	OFF	OFF	OFF	OFF	OFF	ON	OFF
003	OFF	OFF	OFF	OFF	OFF	ON	ON
004	OFF	OFF	OFF	OFF	ON	OFF	OFF
005	OFF	OFF	OFF	OFF	ON	OFF	ON
006	OFF	OFF	OFF	OFF	ON	ON	OFF
007	OFF	OFF	OFF	OFF	ON	ON	ON
008	OFF	OFF	OFF	ON	OFF	OFF	OFF
009	OFF	OFF	OFF	ON	OFF	OFF	ON
010	OFF	OFF	OFF	ON	OFF	ON	OFF
011	OFF	OFF	OFF	ON	OFF	ON	ON
012	OFF	OFF	OFF	ON	ON	OFF	OFF
013	OFF	OFF	OFF	ON	ON	OFF	ON
014	OFF	OFF	OFF	ON	ON	ON	OFF
015	OFF	OFF	OFF	ON	ON	ON	ON
016	OFF	OFF	ON	OFF	OFF	OFF	OFF
017	OFF	OFF	ON	OFF	OFF	OFF	ON
018	OFF	OFF	ON	OFF	OFF	ON	OFF
019	OFF	OFF	ON	OFF	OFF	ON	ON
020	OFF	OFF	ON	OFF	ON	OFF	OFF
021	OFF	OFF	ON	OFF	ON	OFF	ON
022	OFF	OFF	ON	OFF	ON	ON	OFF
023	OFF	OFF	ON	OFF	ON	ON	ON
024	OFF	OFF	ON	ON	OFF	OFF	OFF
025	OFF	OFF	ON	ON	OFF	OFF	ON
026	OFF	OFF	ON	ON	OFF	ON	OFF
027	OFF	OFF	ON	ON	OFF	ON	ON
028	OFF	OFF	ON	ON	ON	OFF	OFF
029	OFF	OFF	ON	ON	ON	OFF	ON
030	OFF	OFF	ON	ON	ON	ON	OFF
031	OFF	OFF	ON	ON	ON	ON	ON
032	OFF	ON	OFF	OFF	OFF	OFF	OFF
033	OFF	ON	OFF	OFF	OFF	OFF	ON
034	OFF	ON	OFF	OFF	OFF	ON	OFF
035	OFF	ON	OFF	OFF	OFF	ON	ON
036	OFF	ON	OFF	OFF	ON	OFF	OFF
037	OFF	ON	OFF	OFF	ON	OFF	ON
038	OFF	ON	OFF	OFF	ON	ON	OFF
039	OFF	ON	OFF	OFF	ON	ON	ON
040	OFF	ON	OFF	ON	OFF	OFF	OFF
041	OFF	ON	OFF	ON	OFF	OFF	ON
042	OFF	ON	OFF	ON	OFF	ON	OFF
043	OFF	ON	OFF	ON	OFF	ON	ON
044	OFF	ON	OFF	ON	ON	OFF	OFF
045	OFF	ON	OFF	ON	ON	OFF	ON

TERMINAL I.D. NUMBER	SWITCH NUMBERS						
	2	3	4	5	6	7	8
046	OFF	ON	OFF	ON	ON	ON	OFF
047	OFF	ON	OFF	ON	ON	ON	ON
048	OFF	ON	ON	OFF	OFF	OFF	OFF
049	OFF	ON	ON	OFF	OFF	OFF	ON
050	OFF	ON	ON	OFF	OFF	ON	OFF
051	OFF	ON	ON	OFF	OFF	ON	ON
052	OFF	ON	ON	OFF	ON	OFF	OFF
053	OFF	ON	ON	OFF	ON	OFF	ON
054	OFF	ON	ON	OFF	ON	ON	OFF
055	OFF	ON	ON	OFF	ON	ON	ON
056	OFF	ON	ON	ON	OFF	OFF	OFF
057	OFF	ON	ON	ON	OFF	OFF	ON
058	OFF	ON	ON	ON	OFF	ON	OFF
059	OFF	ON	ON	ON	OFF	ON	ON
060	OFF	ON	ON	ON	ON	OFF	OFF
061	OFF	ON	ON	ON	ON	OFF	ON
062	OFF	ON	ON	ON	ON	ON	OFF
063	OFF	ON	ON	ON	ON	ON	ON
064	ON	OFF	OFF	OFF	OFF	OFF	OFF
065	ON	OFF	OFF	OFF	OFF	OFF	ON
066	ON	OFF	OFF	OFF	OFF	ON	OFF
067	ON	OFF	OFF	OFF	OFF	ON	ON
068	ON	OFF	OFF	OFF	ON	OFF	OFF
069	ON	OFF	OFF	OFF	ON	OFF	ON
070	ON	OFF	OFF	OFF	ON	ON	OFF
071	ON	OFF	OFF	OFF	ON	ON	ON
072	ON	OFF	OFF	ON	OFF	OFF	OFF
073	ON	OFF	OFF	ON	OFF	OFF	ON
074	ON	OFF	OFF	ON	OFF	ON	OFF
075	ON	OFF	OFF	ON	OFF	ON	ON
076	ON	OFF	OFF	ON	ON	OFF	OFF
077	ON	OFF	OFF	ON	ON	OFF	ON
078	ON	OFF	OFF	ON	ON	ON	OFF
079	ON	OFF	OFF	ON	ON	ON	ON
080	ON	OFF	OFF	ON	OFF	OFF	OFF
081	ON	OFF	ON	OFF	OFF	OFF	ON
082	ON	OFF	ON	OFF	OFF	ON	OFF
083	ON	OFF	ON	OFF	OFF	ON	ON
084	ON	OFF	ON	OFF	ON	OFF	OFF
085	ON	OFF	ON	OFF	ON	OFF	ON
086	ON	OFF	ON	OFF	ON	ON	OFF
087	ON	OFF	ON	OFF	ON	ON	ON
088	ON	OFF	ON	ON	OFF	OFF	OFF
089	ON	OFF	ON	ON	OFF	OFF	ON
090	ON	OFF	ON	ON	OFF	ON	OFF
091	ON	OFF	ON	ON	OFF	ON	ON
092	ON	OFF	ON	ON	ON	OFF	OFF
093	ON	OFF	ON	ON	ON	OFF	ON
094	ON	OFF	ON	ON	ON	ON	OFF
095	ON	OFF	ON	ON	ON	ON	ON
096	ON	ON	OFF	OFF	OFF	OFF	OFF
097	ON	ON	OFF	OFF	OFF	OFF	ON
098	ON	ON	OFF	OFF	OFF	ON	OFF
099	ON	ON	OFF	OFF	OFF	ON	ON
100	ON	ON	OFF	OFF	ON	OFF	OFF
101	ON	ON	OFF	OFF	ON	OFF	ON
102	ON	ON	OFF	OFF	ON	ON	OFF
103	ON	ON	OFF	OFF	ON	ON	ON
104	ON	ON	OFF	ON	OFF	OFF	OFF
105	ON	ON	OFF	ON	OFF	OFF	ON
106	ON	ON	OFF	ON	OFF	ON	OFF
107	ON	ON	OFF	ON	OFF	ON	ON
108	ON	ON	OFF	ON	ON	OFF	OFF
109	ON	ON	OFF	ON	ON	OFF	ON
110	ON	ON	OFF	ON	ON	ON	OFF
111	ON	ON	OFF	ON	ON	ON	ON
112	ON	ON	ON	OFF	OFF	OFF	OFF
113	ON	ON	ON	OFF	OFF	OFF	ON
114	ON	ON	ON	OFF	OFF	ON	OFF
115	ON	ON	ON	OFF	OFF	ON	ON
116	ON	ON	ON	OFF	ON	OFF	OFF
117	ON	ON	ON	OFF	ON	OFF	ON
118	ON	ON	ON	OFF	ON	ON	OFF
119	ON	ON	ON	OFF	ON	ON	ON
120	ON	ON	ON	ON	OFF	OFF	OFF
121	ON	ON	ON	ON	OFF	OFF	ON
122	ON	ON	ON	ON	OFF	ON	OFF
123	ON	ON	ON	ON	OFF	ON	ON
124	ON	ON	ON	ON	ON	OFF	OFF
125	ON	ON	ON	ON	ON	OFF	ON
126	ON	ON	ON	ON	ON	ON	OFF
127	ON	ON	ON	ON	ON	ON	ON

***NOTE:** Disregard paragraphs 2.7.4, Printer Address and 2.7.5, DM3270 Control Unit Address when using 3275 point-to-point. Use these paragraphs when operating in 3276 multipoint only.

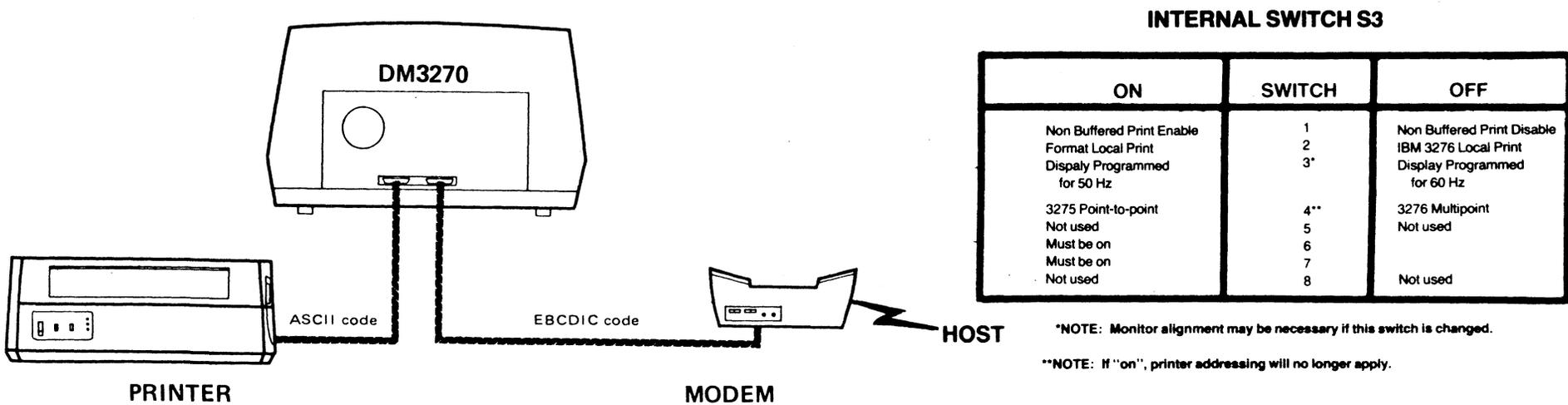
Table 2-3 Control Unit Address Chart
3276 Mode Only

S1-4	S1-5	S1-6	S1-7	S1-8	Control Unit or Device Address	Control Unit Code (EBCDIC)		Select Poll	
						I/O Char.	Hex Code	I/O Char.	Hex Code
Down	Down	Down	Down	Down	0	SP	40	—	60
Down	Down	Down	Down	Up	1	A	C1	/	61
Down	Down	Down	Up	Down	2	B	C2	S	E2
Down	Down	Down	Up	Up	3	C	C3	T	E3
Down	Down	Up	Down	Down	4	D	C4	U	E4
Down	Down	Up	Down	Up	5	E	C5	V	E5
Down	Down	Up	Up	Down	6	F	C6	W	E6
Down	Down	Up	Up	Up	7	G	C7	X	E7
Down	Up	Down	Down	Down	8	H	C8	Y	E8
Down	Up	Down	Down	Up	9	I	C9	Z	E9
Down	Up	Down	Up	Down	10	€	4A	:	6A
Down	Up	Down	Up	Up	11	.	4B	.	6B
Down	Up	Up	Down	Down	12	<	4C	%	6C
Down	Up	Up	Down	Up	13	(4D		6D
Down	Up	Up	Up	Down	14	+	4E	V	6E
Down	Up	Up	Up	Up	15	+-	4F	?	6F
Up	Down	Down	Down	Down	16	&	50	0	F0
Up	Down	Down	Down	Up	17	J	D1	1	F1
Up	Down	Down	Up	Down	18	K	D2	2	F2
Up	Down	Down	Up	Up	19	L	D3	3	F3
Up	Down	Up	Down	Down	20	M	D4	4	F4
Up	Down	Up	Down	Up	21	N	D5	5	F5
Up	Down	Up	Up	Down	22	O	D6	6	F6
Up	Down	Up	Up	Up	23	P	D7	7	F7
Up	Up	Down	Down	Down	24	Q	D8	8	F8
Up	Up	Down	Down	Up	25	R	D9	9	F9
Up	Up	Down	Up	Down	26	!	5A	:	7A
Up	Up	Down	Up	Up	27	\$	5B	#	7B
Up	Up	Up	Down	Down	28	*	5C	@	7C
Up	Up	Up	Down	Up	29)	5D	.	7D
Up	Up	Up	Up	Down	30	:	5E	=	7E
Up	Up	Up	Up	Up	31	7	5F	"	7F



SWITCH S1				SWITCH S2														
SW 1 LOWER CASE DISABLE (UP CHARACTER DISPLAY)				PRINTER CONTROL														
PRINTER ADDRESS				SW 1 NONE	READY	BUSY	REVERSE	ETX ACK	IGN MOFF	ACK MARK	TTY							
1	2	3	4	2	DN	DN	DN	UP	UP	DN	UP							
3	DN	UP	DN	3	DN	UP	DN	UP	DN	UP	UP							
CONTROL UNIT				PRINTER BAUD RATE														
SW 2	DN	DN	UP	UP	SW 4	110	150	300	600	1200	2400	4800	9600					
3	DN	UP	DN	UP	5	DN	DN	DN	DN	UP	UP	UP	UP					
0	1	2	3	4	5	<<	>>	30	31	6	DN	UP	DN	UP	DN	UP	DN	UP
PRINTER PARITY																		
SW 4	DN	DN	DN	DN	DN	DN	UP	UP	SW 7	EVEN	SPACE	ODD	MARK					
5	DN	DN	DN	DN	DN	DN	UP	UP	8	DN	UP	DN	UP					
6	DN	DN	DN	DN	UP	UP												
7	DN	DN	UP	DN	DN	UP												
8	DN	UP	DN	UP	DN	UP												

Printer Port EXTERNAL SWITCHES



ON	SWITCH	OFF
Non Buffered Print Enable	1	Non Buffered Print Disable
Format Local Print	2	IBM 3276 Local Print
Display Programmed for 50 Hz	3*	Display Programmed for 60 Hz
3275 Point-to-point	4**	3276 Multipoint
Not used	5	Not used
Must be on	6	
Must be on	7	
Not used	8	Not used

*NOTE: Monitor alignment may be necessary if this switch is changed.
 **NOTE: If "on", printer addressing will no longer apply.

Figure 2-3 Internal and External Switches With Communications Hookup

2.7.3 Optional Beehive Printer (P1600)

A desk top serial printer for use as an IBM 3287 type printing unit. This printer will print via the DM3270 control unit data from the host or direct from the DM3270. Consult the Printer Operator manual, sent with the printer, for further installation instructions.

2.7.4 Printer Address (S1-2, S1-3)*

These switches specify the address used by the host to select the printer when in the 3276 contention mode. The address can be any number from 1-4 selected as follows:

S1-2	S1-3	Device/ Address	Hex Code Number	I/O Char
Down	Down	1	C1	A
Down	Up	2	C2	B
Up	Down	3	C3	C
Up	Up	4	C4	D

2.7.5 DM3270 Control Unit Address* S1-4, S1-5, S1-6, S1-7, S1-8

This is the address by which the DM3270 is polled or selected by the host when in 3276 contention mode. The address can be any number in a program from 0-31 selected from Table 2-3. Also shown are the actual I/O characters transmitted over the communications line for each control unit address and for each printer address. I/O character ("") is transmitted as the device address during a general poll operation.

2.7.6 Printer Flow Control S2-1, S2-2, S2-3

Several types of printers can be attached to the printer port of the DM3270. These printers use different means for signaling the DM3270 that the printer is busy and cannot accept data. Each printer must provide Data Terminal Ready (DTR) on Pin 20.

S2-1	S2-2	S2-3	Flow Control Type and Printer Type
Down	Down	Down	No Printer attached
Down	Down	Up	Pin 11/19 = Ready
Down	Up	Down	Pin 11/19 = Busy
down	Up	Up	Pin 11/19 = Reverse Channel
Up	Down	Down	ETX/ACK
Up	Down	Up	XON/OFF
Up	Up	Down	ACK/NAK
Up	Up	Up	TTY

***NOTE:** Disregard paragraphs 2.7.4, Printer Address and 2.7.5, DM3270 Control Unit Address when using 3275 point-to-point. Use these paragraphs when operating in 3276 multipoint only.

2.7.7 Printer Speed S2-4, S2-5, S2-6

These switches allow the user to match the terminal baud rate (through the AUX / printer port) with the printer baud rate.

S2-4	S2-5	S2-6	Baud Rate
Down	Down	Down	110 (2 stop bits)
Down	Down	Up	150 (1 stop bit)
Down	Up	Down	300 (1 stop bit)
Down	Up	Up	600 (1 stop bit)
Up	Down	Down	1200 (1 stop bit)
Up	Down	Up	2400 (1 stop bit)
Up	Up	Down	4800 (1 stop bit)
Up	Up	Up	9600 (1 stop bit)

2.7.8 Printer Parity S2-7, S2-8

These switches match the parity of the terminal with the parity of the printer. The switches have the following definitions:

S2-7	S2-8	Parity
Down	Down	Even
Down	Up	Space
Up	Down	Odd
Up	Up	Mark

2.8 INTERNAL SWITCH USE S3-1, S3-2, S3-3

Internal switch S3-1 is used to specify whether the DM3270 will support the buffered or non-buffered print command. The buffer printer operation requires a unique printer address, where the non-buffered print uses the CRT as the buffer.

Internal switch S3-2 is used to provide additional printer support. With this switch in the on position, a local print will not compress null lines and will do a form feed after the print is completed. This option allows information that is displayed on the screen to be formatted on forms using a local print.

Internal switch S3-3 specifies the frequency of the power source. The display should match the power line frequency to avoid beat interference.

Switch 4 is "on" for 3275 point-to-point protocol (see Subhead 2.7.2) and "off" for 3276 multipoint protocol (see Subhead 2.7.4 and 2.7.5).

Switches 6 and 7 must always be on and should not be changed since they control the reverse video and highlight features.

SECTION III OPERATION

3.1 BASIC OPERATION

This section provides detailed operating instructions for the DM3270 Control Unit Display Station. Subhead 3.1 provides a description of the basic operating environment and explains how to turn on the terminal. Subhead 3.2 gives a detailed description of the operation of the display and Subhead 3.3 describes how to operate the keyboard. Subhead 3.4 describes the operation of the printer, and Subhead 3.5 describes the self-confidence test provided with the terminal.

3.1.1 Operating Environment

The DM3270 is a remote terminal operating in a polled communications environment where operation may be over either leased/dedicated communication lines or through a display facility. For this use, the terminal does not communicate with the host computer as each key on the keyboard is depressed. Instead, the operator enters a logical set of data into the terminal's display buffer in response to a request from a host program and then transmits all the data to the host as a single message.

A logical set of data could consist of several paragraphs of a document being edited (unformatted data), it could be several fields of data entered in response to a formatted display produced by a host application program, or it could be the selection of an item from a displayed menu. When the requested data has been entered, the operator uses one of the program attention keys to tell the terminal to transmit data to the host. At the next poll or request from the host for a data transmission, the terminal's display buffer is transmitted to the host. The operator then waits while the host program processes the entered data and generates a response which is usually displayed on the screen. The response may include a request for more data. A typical application will include a series of such operations as has just been described.

The display screen keeps the operator informed on the state of the terminal. The first 24 lines show the contents of the display buffer. Any change in the contents of the buffer, either by the operator (through the keyboard) or by the host is immediately shown on the display. The 25th line of the display is a status line which informs the operator of all other aspects of the terminal's operation. For example, the operator can tell if the terminal is being polled by the host, whether or not the terminal is transmitting or receiving data from the host, the status of the printer, whether or not the keyboard is enabled and the type of field into which data is currently being entered. Subhead 3.2 describes the status line display and its operation.

Keyboard operation is simple and straightforward. Any typist can master the keyboard, which bears a close re-

semblance to the standard typewriter. The few additional keys function as operator-oriented convenience features and selector switches for the terminal's operating modes. Subhead 3.3 describes in detail how to operate the keyboard.

The printer (if attached) is shared by the terminal operator and the host. The operator can request a print out of the terminal's display buffer and the host can independently transmit data to the terminal for printing without disturbing the display. Subhead 3.4 describes printer operation in detail.

3.1.2 Turn-On Procedure

Before the DM3270 is used, it must be properly installed and setup in accordance with Section 2 of this manual. The installation should be done only by qualified personnel.

An identification plate located on the rear panel of the terminal specifies its electrical power requirements. When moving the terminal to an alternate operating position, make sure that the selected power outlet is properly grounded and supplies the correct operating voltage and frequency. Get technical assistance, if necessary, in making this determination.

The proper turn-on procedure for the terminal is as follows:

- a. Set the rear panel POWER ON/OFF switch to ON (see Figure 2-3; allow a warm-up period of about a minute and ensure that the cursor and status line have appeared on the screen. If both the cursor and status line do not appear, check the brightness and contrast adjustments as explained in b.
- b. Turn the brightness control (BRT located on the rear panel; see Figure 2-3, if necessary) until a raster is faintly visible on the screen. Enter several characters on the screen. Reduce the brightness until the background raster (diagonal lines) is extinguished. Adjust the contrast control (CONT on the rear panel) until the characters are easily read in the available room light. The adjustment can best be made when characters are displayed in both normal and bright intensity. Such a display must be called up from the host CPU.
- c. Any time power is initially applied to the DM3270, it performs a display memory test and a terminal operation test. Because of the CRT warmup time, there is no visible effect on the screen. If the unit is turned off and back on, a slight display flicker occurs while the test is run. When the self-test is successfully completed, "Idle" appears on the status line. In the event of a test failure, error messages (see Subhead 3.2.5) will appear

on the screen. The self-test may also be initiated by pressing the TEST key.

3.1.3 Rear Panel Switches

Switch blocks 1 and 2 (S1 and S2) on the rear panel select certain operating features of the DM3270. There are a total of 16 miniature switches, eight on each switch block. Most rear panel switches require no operator attention because they must be properly set when the terminal is installed. Subhead 2.7 describes how to change a switch.

3.1.4 Audible Alarm

The audible alarm capability within the terminal alerts the operator when error conditions arise. The following conditions sound the audible alarm.

1. At the start of the self-confidence test.
2. An invalid keyboard entry.
3. The host computer wants to alert the operator.

3.2 DISPLAY OPERATION

3.2.1 Display Format and Character Set

Data to be displayed on the CRT screen is stored in a 1,920 character buffer. The data is displayed as 24 lines of 80 characters. The data in the buffer consists of displayable data and field attributes. The displayable data consists of 95 EBCDIC displayable characters (alphanumerics-includes space) and 11 graphic symbols for drawing lines and tables. Data are entered into the display buffer and consequently displayed on the screen either by the operator pressing keys on the keyboard or by the host transmitting data over the communications line to the DM3270. The graphic symbols can only be placed in the display buffer by the host. There are no keys on the keyboard for this purpose.

3.2.2 Cursor Operation

A cursor is provided to identify the position in the display where the next character entered from the keyboard will be displayed. Two types of cursors can be displayed: 1) The normal cursor appears as an underline. 2) The alternate cursor appears as a reverse image of the character displayed in the cursor position, i.e., a dark character in a light background. By using the ALT CURSR and CURSR BLINK keys (see Figure 3-2, page 1), the type of cursor can be selected and the cursor can be made to appear steady or blink on and off continuously.

When the cursor is positioned over an existing character in the display, that character will still be visible and can be changed or deleted by keyboard action. Only one cursor will appear in the display. When the terminal is turned on, the cursor will appear at the leftmost character position of the first line of a blank screen. The cursor can be moved around the screen by using the cursor movement keys (see

Figure 3-2).

3.2.3 Display Fields

The host CPU can organize the display, in one or more separate display fields, by the introduction of attribute characters into the display buffer. The operator can only enter displayable data into the display buffer.

Display fields can simplify operations, both for the operator and for the programmer. Headings can be displayed to prompt the operator to enter data and separate fields can be defined for entry of the data. The host program can identify the fields that contain entered data without reading the entire buffer. The field can also be restricted as to the data that can be entered, thus saving the program time on error checks. In addition, the attribute character serves as a tab stop. This makes it easier for the operator to move the cursor from one field to another by using the tabbing keys.

A display field begins with an attribute character. This character occupies a display position on the screen but is displayed as a blank. All character positions following the attribute character up to, but not including, the next attribute character constitute the field. A field may wrap from one line to the next, i.e., if the field begins in the middle of one line and the next attribute character is located in other than the first character position of the next line, the field will contain character positions in both lines. Similarly, a field may wrap the screen. If the first character position of the first line of the display does not contain an attribute character, the last field of the screen will wrap from the last line of the display to the first line. All logical attributes (see Subhead 3.2.4) will wrap with a field and visual attributes will wrap from line to line or from the bottom to the top line of the screen.

3.2.4 Field Attributes

There are two types of field attributes, visual and logical. Visual attributes determine the manner in which the fields appears to someone observing the screen. Data are normally displayed at a normal intensity (normal mode). If it is desirable to highlight an important field, the field can be intensified (intensified mode), and the field will appear much brighter. A field can also be displayed in security mode. Even though the data exists in the display buffer, the data will be displayed as blanks. This mode can be used, for example, to enter a password without allowing it being observed by someone else looking at the screen.

The DM3270 also provides the extended field highlighting capability of the IBM 3278. This field highlighting attribute provides the capability of underlining, blinking and reverse video.

Logical attributes can be used to restrict data entry in a particular field. The field can be defined either as protected or unprotected. Data cannot be entered from the keyboard into a protected field. An attempt to enter data into a protected field will disable the keyboard and the operator will not be able to enter any data until the RESET key is depressed (see Subhead 3.3.4). A protected field may be defined

as an automatic skip field. This attribute causes the cursor to skip to the next unprotected field when it enters an automatic skip field, which again makes it easier for the operator to move from one data field to another.

If a field is unprotected, it can also be defined as alphanumeric or numeric. Any displayable character can be entered into an alphanumeric field. Only numeric data can be entered into a numeric field (see Subhead 3.3.4). Again, an attempt to enter invalid data into a numeric field will disable the keyboard.

Any displayed field may be given the selector light pen detectable attribute. This attribute allows the field to be selected for transmission to the host by operating the CURSR SET key. This feature allows the programmer to restrict the amount of data that must be transmitted to the host.

3.2.5 Status Line

The status line occupies the 25th line of the display. It is not accessible to the operator or the host. It is only accessible to the DM3270 for the display of current status information. Normal status indications are displayed as dark char-

acters in a light background. Error indications can be displayed in a blinking mode. The status line contains 9 fields, A - I, spaced sequentially across the line. Each field is separated from the next field by one character position displayed as a blank in normal video mode (dark background). Each field is discussed in Figure 3-1.

3.2.6 Lower Case Inhibit (LCI)

LCI mode allows the operator to limit the display to upper case characters only. When the LCI switch is in the inhibit position (see Figure 2-3), all new alphabetic character codes entered into the display buffer, either from the I/O or the keyboard, are stored and displayed as upper case characters. When the LCI switch is changed to the non-inhibit position, new alphabetic character codes entered are stored and displayed in their natural mode (as upper or lower case characters). When the switch is changed back and forth from one position to another, previous data entered on the screen are not updated by the switch.

3.3 KEYBOARD OPERATION

The keyboard enables the operator to change, edit, or



Field A Indicates whether the keyboard is inhibited or not. The message "Input Inhibited" will be displayed whenever the operator cannot key in any data. See Subhead 3.3.3 for the situations that will cause this message and how to clear it.

Field B Indicates the state of the terminal in communicating with the host. The messages that can be displayed in this field are as follows:

IDLE The terminal is in an idle state. Refer to the poll field of the status line (Field I) to see if the terminal is being polled by the host. This is the state in which the operator can enter data.

ENTER The ENTER key has been depressed and the terminal is either awaiting a poll or transmitting text to the host. The keyboard is disabled.

SYSTEM The terminal has received an acknowledge for the last entry and the system is currently processing the text message. The keyboard is disabled.

TEXT The terminal has received a start of text character (STX) and is receiving text. This message will be displayed until the acknowledge has been sent to the host. The keyboard is disabled.

NOTE: If during any of these operations a negative acknowledge (NAK), a retransmit request (ENQ) or a time-out is experienced, this field will blink.

Field C Indicates the presence or absence of the Data Set Ready signal from the modem. The field will always contain the message "DSR". If the DSR signal is present, the message will be displayed at normal intensity and non-blink mode. If the DSR signal is not present, the message will blink at bright intensity.

Field D Indicates the type of attribute that is controlling the field in which the cursor is located. The possible messages are as follows:

ALPHA Any alphanumeric character can be entered.

NUM Only numeric data (0-9,..., or DUP) can be entered.

PROTECT ATTRIBUTE No entry may be made in this field.

NOTE: If any invalid entry is made, the keyboard will be disabled, field D will blink, and field A will display "Input Inhibited." The keyboard will remain disabled until RESET key is pressed.

Field E Indicates whether or not either of the SHIFT keys is depressed or the SHIFT LOCK key is locked. This field will be blank when none of the keys is depressed. The field will display "SHIFT" when either of the SHIFT keys is depressed or the SHIFT LOCK key is in the locked position.

Field F Indicates whether or not the terminal is in insert mode. The message "Insert" will be displayed when the operator depresses the INSERT key. This field will be cleared when the keyboard is reset.

NOTE: If the operator tries to enter more data into a field than it can hold, the keyboard will be disabled. Field F will blink and field A will display "Input Inhibit." The keyboard will remain disabled until reset.

Field G Indicates the status of the printer. The ready signal is Data Terminal Ready (DSR). The printer does not have any ready signal, therefore, the printer is always assumed ready. The messages that can be displayed in this field are:

PRNTR CHK
BLANK The terminal is not receiving a ready signal from the printer.
PRNTR RDY The terminal is receiving a ready signal from the printer.
PRNTR BSY The printer is processing a print request.

Field H Reserved for future expansion.

Field I This field displays a polling indicator while the terminal is being polled. The field is blank when the terminal is not being polled.

Figure 3-1 Status Line Messages and Field Descriptions

create character displays and transmit them to the host computer or to the local printer. Figure 3-2 shows the keyboard layout and gives a functional description of each key.

The keyboard looks very much like a typewriter keyboard. The keys in the center produce the alphabetic characters, numeric characters, punctuation marks and special symbols. These are displayable characters (alphanumeric). Surrounding these keys are the special function keys which are used to perform control functions. To the far right is a numeric pad which is convenient to use in data entry applications and is also used in special function operations.

3.3.1 Keyboard Modes

The keyboard operates in 3 modes, unshifted, shifted, and alter. Each mode provides a different interpretation of some of the keys and extends the number of key functions without requiring an excessive number of keys. Each key is labeled to indicate the function it performs in each mode. The symbols on the top face of the key indicate the function performed in unshifted mode (lower symbol) and the shifted mode (upper symbol). For example, the key containing the 2 and @ acts as a 2 in unshifted mode and a @ in shifted mode. The symbol on the front face of the key indicates the function performed in alter mode. For example, the 2 key acts as a PROGRAM FUNCTION KEY 2 when in alter mode.

The shifted mode is selected by depressing either one of the SHIFT keys marked with the \uparrow symbol or by pressing the SHIFT LOCK key marked with the \updownarrow symbol. The SHIFT keys are active only while depressed. Releasing them returns the keyboard to the unshifted mode. The SHIFT LOCK key also becomes active when depressed and remains active until a SHIFT key is again depressed. The shifted status of the keyboard is indicated in the status line (see Figure 3-1).

The alter mode is selected by depressing and holding the ALT key while pressing one of the other keys. The alter mode is used mainly to activate special function keys that might have serious consequences if activated accidentally, e.g., the CLEAR key which would clear the display buffer.

3.3.2 Typamatic Operation

Normally, when a key is pressed, it will only perform its intended operation once. Some keys will repeat their operation continuously as long as they are held down. This is called typamatic operation. All alphanumeric keys operate in this manner. The special function keys that have typamatic operation are identified in Figure 3-2. The repeat rate is 10 characters per second.

3.3.3 Keyboard Disable (Input Inhibit)

Certain conditions disable the keyboard and prevent further entry by the operator. This condition is indicated by an

"Input Inhibit" message in the status line and may sound the audible alarm. See Figure 3-1 and CLICK key description in Figure 3-2, page 2. The conditions that disable the keyboard are listed below. Conditions 4, 5, and 6 cause the audible alarm to sound.

1. Operation of any program attention key.
2. A host-initiated I/O operation addressed to the terminal.
3. An operator initiated print operation, during the transfer of the display buffer to the printer buffer. If the printer buffer is full, the transfer cannot take place, so the keyboard will be disabled until the full condition goes away.
4. Operation of any alphanumeric key or of the DUP, FIELD MARK, ERASE EOF, or delete key (\backslash), when the cursor is in a protected field or in a field-attribute location.
5. Operation of any alphanumeric key not included in the numeric grouping when the cursor is in a numeric field.
6. An attempt is made to insert data into a full field.

The keyboard disable condition can be cleared by the following.

1. Pressing the RESET key for conditions 4, 5, and 6 above.
2. Pressing DEV CNCL for printer busy conditions (condition 3).
3. Host initiated I/O will be reset by specific command from the host. Condition 1 will normally be reset in this manner also.

3.3.4 Alphanumeric Data Entry

Keyboard entry of an alphanumeric character into the display buffer occurs at the cursor location. An attempt to enter an alphanumeric character into a protected data field or into an attribute character location will be blocked. Successful keyboard entry of the alphanumeric character causes the cursor to advance to the next character location within the unprotected data field. If the cursor advanced to the right-most character position on the line, it automatically moves to the first character position on the following line.

If the cursor, after advancing, is at an attribute character location, it advances to the first character position of the field defined by the attribute character. If, however, the field has been defined as an AUTO SKIP field, the cursor skips to the first character position of the next unprotected field, or if there are no unprotected character locations in the buffer, to the first character position in the buffer.

In a formatted buffer, attempting to enter a character into a field invokes several tests on that field. First, the field must be defined as unprotected. Second, if the field is defined as a numeric field, the character being entered must be one of the following:

0 1 2 3 4 5 6 7 8 9 . - DUP

queued and will start as soon as the previous job is finished. The keyboard is disabled and the display buffer is copied to the printer buffer as space becomes available. When all the display data has been copied, the keyboard is enabled again. A second print request could be entered by the operator before the first one completes printing. But the display buffer cannot be transferred to the printer buffer until the previous job has printed enough data to release sufficient space in the printer buffer to hold the new display data. All buffers hold 2056 characters, but some of the display data (security fields and null lines) may be transferred on a given print request. The keyboard will be disabled until all the display data has been transferred to the printer buffer.

The status line indicates the printer status in field G (see Figure 3-1). A blank status indicates the printer is not ready. This could indicate conditions such as a nonexistent printer, a malfunctioning printer, the printer is out of paper, the printer has been deselected or perhaps other conditions. The operator will have to check the printer to determine its status. A PRNTR RDY status indicates the printer is ready for a print request. When the printer begins printing, PRNTR BSY is displayed until all the data in the printer buffer is printed.

3.5 SELF-CONFIDENCE TEST

The DM3270 terminal incorporates a basic self-confidence test to insure that the terminal is working correctly. The self-test is invoked when the terminal is powered on or when the operator depresses the TEST key. When the self-test is completed, the terminal is initialized with a clear screen and enters the idle mode.

The self-test begins by sounding the audible alarm and then tests various hardware components of the terminal. Two types of errors are detected: fatal and nonfatal. An error is fatal when it occurs in the RAM memory required by the self-test (address 8700-87FF Hex) or if it is reasonably certain that the CRT display will not work. When a fatal error is detected, the audible alarm will be sounded 3 times and the terminal will stop functioning. *The terminal can only be restarted again by turning the power off and on.*

Each nonfatal error is reported by displaying a unique number or letter code on the display screen starting at the Home position. The nonfatal errors and their letter codes are listed in Table 3-2.

The DM3270 provides line monitoring capabilities (monitor mode) which displays all data including control characters as they are received or transmitted. The DM3270 usually displays only text addressed to the receiving terminal. In monitor mode, all data that are received from the host is displayed in normal video and all data that are sent to the host, including pads, will be displayed in reverse video. The operator may enter monitor mode by depressing the ALT, SHIFT, and TEST keys simultaneously.

Table 3-2 Self Confidence Test Error Descriptions

Error Code	Error Description
n p	CRC check error for ROM chip(s) 'n', where n = 1, 2, 3, 4, and/or 5 RAM memory has failed
R	Printer port baud rate clock write/read error
A	Main port USART write/read error
B	Keyboard scanner (8255) write/read error
C	Printer port interrupt error
D	Printer port timeout error
H	Printer port receiver error (parity, overrun, framing)
I	Printer port received data error
J	Video clock rate error
K	Printer port baud rate error
L	

CURSR SEL (also see Note 1)

This key allows the operator to select certain fields displayed on the screen for action by the host program. In a typical application, a menu of items might be displayed and the operator could select one or more items from the menu.

There are two types of selectable fields that can be displayed on the screen: 1) selection fields and 2) attention fields. The CURSR SEL key can be used to 1) select items in selection fields and 2) notify the host program of the selection by selecting an attention field. The CURSR SEL key acts like a program attention key when selecting an attention field.

The first character of each selectable field on the screen is called a designator character. The designator character for a selection field is either a question mark (?) or a greater-than sign (>); the designator character for an attention field is an ampersand character (&) or a blank. Initially the designator characters in most of the selection fields on the screen will be question marks. To select an item (field), position the cursor within the selection field that is to be selected and press the CURSR SEL key. The question mark at the beginning of the selected field will change to a greater-than sign to indicate that the field has been selected. If the wrong field has been selected, the mistake can be corrected by selecting the field again. This action changes the greater-than sign back to a question mark and deselects the field. The correct field can then be selected.

After completing the selections from the screen (more than one selection can be made), locate a selectable field (attention field) that has an ampersand character or a blank position for a designator character. Selecting the attention field alerts the host that data is ready to be transmitted. The keyboard will be disabled until the host responds.

The way a CURSR SEL operation is ended depends on the host program. Each application could be different. Specific instructions must be supplied for the application on which the operator is working.

Program Function Keys (PF) (also see Note 1)

Many of the special function keys have permanently assigned functions such as backspace, tab, etc. The program function keys may be assigned functions by a host application program. There are 24 PF keys which can only be invoked with the ALT key held down. The operator must be supplied with specific instructions on how to use these keys in a particular application.

The PF keys have typamatic capability. Great care should be exercised in using this capability.

SYS REQ (also see Note 1)

When pressed with the ALT key held down, this key informs the host that a test request message has been keyed into the display buffer. This function is usually invoked when the terminal may be experiencing problems and the operator wants the system to perform a test of the terminal. The operator should consult his organization's procedures for the correct use of this key.

CURSR BLINK

Pressing this key the first time causes the cursor to blink. Pressing the key again causes the blinking to stop.

ALT CURSR

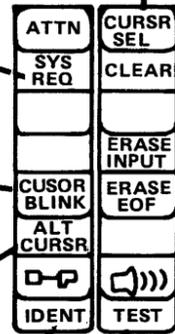
Activation of this key changes the type of cursor. The underline will be changed to a rectangular block and vice versa.

Print Operation

Pressing the print key causes the information on the screen to be printed on the printer attached to the terminal. If the printer buffer is not full, the display buffer will be copied to a printer buffer. The keyboard is disabled during this copy, but is re-enabled again as soon as the copy is completed. This should not take very long. If the printer is already printing data transmitted from the host, the display screen will be printed as soon as the previous operation is completed. If the printer buffer is full, the display buffer cannot be copied and the keyboard is disabled. The operator can wait for the current print to complete. The print request will then be started or the operator can cancel the current print operation by simultaneously pressing ALT and DEV CNCL and the print request will be serviced. The keyboard will immediately be reenable, and the operator can then do some other operation.

IDENT

Since only one printer is attachable to the DM3270, the IDENT key is nonfunctional.



TEST

The TEST key is used to invoke the self-confidence test functions resident in the DM3270. Pressing the key restarts the terminal just as if the power had been turned off and on. It terminates any print operation, any host communications, clears and resets the display screen and executes the self-confidence test functions that are automatically executed when the terminal is powered on. If any errors are discovered while executing the tests, error messages are displayed. If no errors are discovered, the screen remains blank. When the tests have been completed, the terminal resumes its normal mode of operation. Any error messages will remain on the screen until cleared by the operator. While executing the tests, the keyboard and the communications port are disabled.

DEV CNCL

The operator can use this key to cancel the currently printing operation.

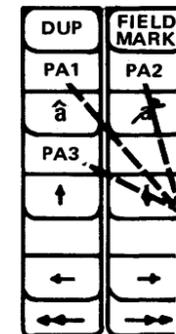
RESET Key

The RESET key is used to recover from an inhibited keyboard operation that has resulted in a disabled keyboard. When the keyboard is disabled, no other keyboard operations are honored. The RESET key cannot reset a disabled keyboard when the terminal is sending data to, or receiving data from the host. The RESET key can also be used to terminate an insert mode operation. See Subhead 3.3.3 for additional discussion of RESET.

ENTER (also see Note 1)

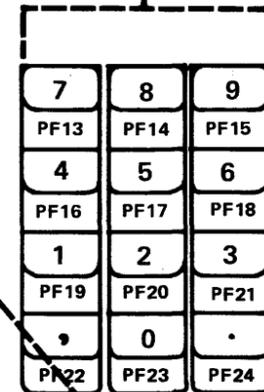
Pressing the ENTER key informs the host program that a message is completed and ready to be transmitted to the host for processing.

SHIFT KEYS



Program Access Keys (PA) (also see Note 1)

These three keys may only be invoked with the ALT key held down. They are also assigned functions by the host application program. They differ from the PF keys in that no data can be transmitted to the host. Only the attention code is transmitted. The operator must be supplied with specific instructions on how to use these keys.



NOTE 1: Program Attention Keys

These keys solicit host program action by causing an I/O pending condition to occur at the display terminal. When the next poll is received from the host, the terminal transmits an attention code, identifying the particular attention key that was depressed. Some data may also be transmitted, depending on the type of attention key that was depressed. The host program provides its own interpretation of the attention keys; therefore, the operator must be given explicit instructions concerning the use of these keys.

The program attention keys are CLEAR, ENTER, SYS REQ, the Program Function (PF) keys and the Program Access (PA) keys. Also, CURSR SEL may act as an attention key, depending on the contents of the display buffer. The operator must be given explicit instructions for using the CURSR SEL key in a particular application. The PF keys have typamatic capability.

The ATTN key is provided on IBM 3276 terminals for use with the SNA protocol. This key is nonfunctional on the DM3270.

**Figure 3-2
Keyboard Layout and Key Description**

**Figure 3-2
Keyboard Layout and Key Description**

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Erase Input

This key erases all unprotected character locations and repositions the cursor to the first unprotected character location on the screen. In a buffer with only protected data fields, no character locations are erased and the cursor is repositioned to the Home position. If the display contains no fields, the entire buffer is erased and the cursor repositioned to the Home position.

Erase EOF

If the cursor is located in an alphanumeric character location in an unprotected data field, the character in the cursor location and all remaining character locations to the right in the field are erased (replaced by nulls). The operation wraps 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 the operation.

Operation of this key when the cursor is located in an attribute character location or is within a protected data field disables the keyboard.

Tab

The cursor is moved to the first character location of the next unprotected data field. In a display with no unprotected fields, the cursor is repositioned to the Home position.

CLEAR (also see Note 1)

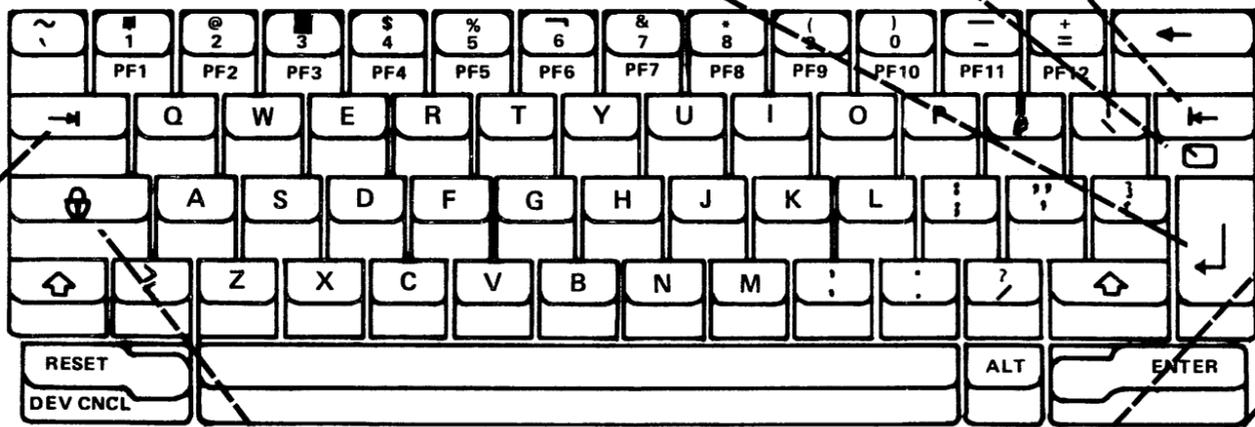
Pressing the CLEAR key with the ALT key down 1) erases or blanks every character location on the screen except the status line, 2) establishes an unformatted display and 3) positions the cursor to the first location on line 1. The CLEAR key does not change the keyboard shift status of the terminal, but it does change the field status.

Click Key

The click feature can be enabled or disabled with the click key. The click is disabled after power up or a master clear operation. Generally:

1. When the click key is enabled, it tells the operator that the keyboard is operational and that the data being keyed in is being accepted. In this case, the absence of the click indicates that the keyboard is disabled.
2. When the click key is disabled, the absence of the click tells the operator that the keyboard is operational and that the data being entered is being accepted. In this case, the presence of the click indicates that the keyboard is disabled.

By being aware of the clicking, or its absence, the operator can easily tell when operation is normal. When operation is not normal, the status line should be examined for a problem indication.



Backtab

When the cursor is located in the field attribute character position, the first alphanumeric character location of an unprotected data field, or in any character location of a protected data field, it is moved to the first alphanumeric character location of the first preceding unprotected data field. When the cursor is located in any alphanumeric character location of an unprotected data field other than the first location, it is moved to the first alphanumeric character location of that field. If there are no unprotected fields, the cursor is positioned to the Home position.

HOME

The cursor is moved to the first unprotected character position on the display screen. In an unformatted display, the cursor is positioned to the leftmost character of the first line of the display (Home position).

NEW LINE

The cursor is moved to the first unprotected character location of the next line. If the display has no unprotected data fields, the cursor is positioned to the Home position. If the display contains no fields, the cursor is repositioned to the first character position of the next line.

DUP

Operation of this key causes a unique character code to be entered into the display buffer and a tab operation to be performed. The DUP character provides a means of informing an application program that a duplicate operation is indicated for the rest of the field in which the DUP character is located. The DUP character is transferred as a DUP code when the data is read from the display to the host program. No duplicate operation is performed at the terminal. The meaning of the DUP code is application program dependent. The DUP character, when stored in a device buffer, is displayed as an asterisk (*) with an overstrike. The DUP is printed as an asterisk on a printer.

Operation of this key when the cursor is located in a field-attribute location or within a protected data field disables the keyboard.

Insert Mode

This key places the keyboard in the insert mode of operation. The insert mode is indicated by the "Insert" indicator in the status line. If the cursor is located in an unprotected data field, operation of an alphanumeric key causes that alphanumeric character to be entered at the cursor. The character formerly occupying the cursor location and all remaining characters within the field are shifted one character location to the right. Note that null characters are not shifted.

When the field is filled with non null characters, operation of an alphanumeric key causes the keyboard to become disabled. Field-attribute characters 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 alphanumeric key while in insert mode when the cursor is located in a field-attribute character location or is within a protected data field will disable the keyboard.

Operation of the RESET key, ENTER key, or any other key that causes host communication, returns the keyboard to normal mode. (Operation of the CURSR SEL key also returns the keyboard to normal mode.)

Delete Character

If the cursor is located in an alphanumeric character location in an unprotected field, operation of the delete key removes the character from the location identified by the cursor. The cursor does not move. All remaining characters in the unprotected field to the right of the cursor and on the same row will be shifted 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 are not affected.

Operation of this key when the cursor is located in a field-attribute character location or within a protected data field disables the keyboard.

Field Mark (EM)

Operation of this key causes a unique character code to be entered into the display buffer. The field mark character provides a means of identifying, to an application program, the end of a field in an unformatted buffer or a subfield in a formatted buffer. The field mark character is transferred as a EM code when the data is read from the display to the host program. The field mark character, when stored in a device buffer, is displayed as a semicolon (;) with an overstrike. The EM code is printed as an asterisk (*) on a printer.

Cursor Up

The cursor is moved to the same character position of the preceding line. If the cursor is in the first line of the display, it is moved to the last line.

Cursor Movement Keys

The cursor can be placed at any character position in the buffer under keyboard control (including unprotected and protected alphanumeric character and field attribute character locations) and may be moved freely without loss of data (nondestructive cursor). All these keys have typematic capability.

There are four character oriented keys, each of which moves the cursor one location at a time. All four key operations cause the cursor to wrap from the end of the last line on the display to the beginning of the first line.

Fast Scan Left and Right

These two keys move the cursor left or right, as shown. When using these keys the cursor moves two character positions at a time.

Cursor Left

The cursor is moved one character position to the left. If the cursor is at the leftmost character position of the line, it is moved to the rightmost character position of the line above. If the cursor is in the first line of the display, it is placed in the rightmost character position of the last line. There are two of these keys.

Cursor Down

The cursor is moved to the same character position of the following line. If the cursor is on the last line of the display, it is moved to the top of the display.

Cursor Right

The cursor is moved one character position to the right. If the cursor is at the rightmost character position of the line, it is moved to the first character position of the following line. If the cursor is advancing from the last line of the display, it is positioned to the first character position of the first line of the display.

BEEHIVE INTERNATIONAL



LIMITED WARRANTY INFORMATION

Beehive's Equipment is warranted against defects in material and workmanship for a period of ninety (90) days from date of shipment to Beehive's direct customer. ¹ Beehive will repair or, at its option, replace Equipment which proves to be defective during the Warranty Period, provided such Equipment is returned to Beehive's factory as hereinafter provided.

No defective Equipment may be returned to Beehive without an Advance Return Authorization from the Beehive Field Service Department (801/355-6000). The Return Authorization number must be referenced on both the shipping container and the packing list.

Subject to all of the above conditions, Equipment found to be defective may be returned to Beehive's factory freight prepaid. Following repair or replacement, said Equipment shall be returned to the shipping party, freight collect.

The following items are not covered by warranty:

- a. Routine maintenance and adjustment that is required to maintain products for operations as specified in the Maintenance Guide or Operators Manual.
- b. Failure or malfunctions which occur as a result of improper maintenance, operation (including hostile operating environment), or lack of care.
- c. Components (if any) which are specified in the Maintenance Guide or Operating Manual as being excluded from warranty.
- d. Malfunctions which occur as a result of customer supplied interfacing.

LIMITATIONS OF WARRANTY

The foregoing warranties are in lieu of all other warranties express or implied, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. In no event will Seller be liable for consequential damages.

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¹Beehive's standard terms and conditions provide for a pass-through warranty to its contract customers as follows:

Buyer may pass on to its customer, Seller's standard Equipment warranty in effect at the time such Equipment is purchased by Buyer, provided that Buyer advises Seller in writing as to the date Buyer ships to its customer, including customer address, within ten (10) days from date of shipment to Buyer's customer. Failure to so notify Seller voids all warranty obligations on the part of Seller. In no event shall Seller have any obligation under this warranty clause to Buyer or Buyer's customer after one hundred and eighty (180) days from the date of shipment to Buyer.

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