OMRON

8025AG

8025G-24 CRT TERMINAL

OPTION 1

TECHNICAL MANUAL

OMRON CORPORATION OF AMERICA

INFORMATION PRODUCTS DIVISION

432 TOYAMA DRIVE, SUNNYVALE, CA 94086

(408) 734-8400 • TWX 910-339-9341

Ramtek 988-2211

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CONTENTS

1.1   SCOPE AND PURPOSE

The option package covered by this manual consists of modifications to the Standard 8025G CRT Terminal designed to implement and enhance certain functional capabilities of the terminal's stored control program. With these modifications, the terminal provides a number of operating features intended to facilitate the use of its editing and protected-format capabilities, as described in Section 2. The physical changes in the terminal are described in Section 3.

The operating features described in this manual are as follows:

Scroll Up
Scroll Down
Next Page
Previous Page
Insert Character
Delete Character
Insert Line
Delete Line
Clear Line
Clear Screen
Clear Memory
Enter Protect Field Mode
Reenter Normal Mode
Start Protected Field Without Auto Tab
Start Protected Field With Auto Tab
Start Unprotected Field
Cursor Left, Right, and Home (Protect Field Mode)
Cursor Up and Down (Normal Mode)
Tab Set and Clear
Tab and Back Tab
Video Attributes-Normal Video, Reverse Video, Underline On,
     Video Off, Dim Video, Dim Reverse, Blink, Blink Reverse
Transmit Non-Protect Fields
Suppress CR (Carriage Return) Display
Enable CR (Carriage Return) Display
Process Control Characters
Blank-Out Control Characters
Keyboard Lock and Unlock
Quotation Mode

1.2   DISPLAY MEMORY

The modified terminal has a display (refresh) memory that stores 48 lines of 80 characters each, or a total of 3840 characters. Thus, since the CRT screen displays up to 24 lines at any one time, the memory may be considered as holding two pages of text. The CRT screen acts as a display window that can be moved back and forth (scrolled) over the memory.

When moved backward, the display window eventually stops at the logical beginning of display memory; when moved forward, it stops at the logical end of

display memory. Logical beginning of memory is defined as the address of the first text character on the first line in display memory (page base address). Logical end of memory is defined as the address of the first text character in the display window + 1920 when the window contains the last line in display memory.

Although the display memory extends physically from address $30,000_8$ to $37,377_8$, it is functionally circular and continuous in the same sense as a long sheet of paper bent around in an endless loop. Initially (e.g., at power-on or reset), the physical and logical beginnings of display memory coincide and lines may be entered until the memory is filled. With the memory full, any lines added at the end will be written over succeeding lines at the beginning (i.e., starting at address $30,000_8$) and the logical beginning of memory will be moved forward correspondingly. This means, of course, that the original lines of text entered at the beginning will be lost.

1.3   PROTECT FIELD MODE

The protect field mode of the terminal allows a form to be set up in display memory in which designated text areas--titles, legends, instructions, etc.-- are "protected." That is, when the variable data called for is entered on the form, the protected areas cannot be interfered with.

A protected form is set up with the terminal in "normal" mode (i.e., state at turn-on or reset) by the use of special control characters, and the terminal is then switched to the protect field mode for data entry. When the form is filled in as required, the unprotected data--or if necessary, the entire form--may be transferred to the auxiliary storage device, the printer, or the communications line.

1.4   QUOTATION MODE

Quotation mode allows the operator to enter any 7-bit ASCII character into display memory. This mode enables the sending of special characters to peripheral devices, such as some printers and cassettes, which require initializing for functions such as line width, margin position, and tab stop position. It is also used to set up formats for storage on the mass storage device.

In quotation mode, all 7-bit functions are not interpreted; they are blindly placed in display memory. The graphic representation on the CRT screen conforms to the ANSI standard symbols.

Quotation mode cannot be entered from protect mode. Insert and delete line and character may be used in quotation mode.

1.5   UPPER CASE ALPHA MODE

For systems that do not recognize lower case ASCII character codes, the facility of encoding only the upper case (capital letters) alphabet is provided. Keyboard functions other than the 26 alphabetic character keys are totally unchanged. The SHIFT key still works normally.

2.1   GENERAL

This section describes the operating features and keyboard functions added to the standard 8025G terminal under this option. The features fall into three basic operating categories: scroll, edit, and protect field mode; each of these is covered in a separate subsection.

It should be noted that most of the operating features may be used with the terminal in either protect field mode or "normal" mode (i.e., the state of the terminal at turn-on or reset). Some of the features, however, function somewhat differently in the two modes, and where this is true, both cases are covered in the feature description.

The description of each individual operating feature includes the control key or keys (if any) and escape sequence used to execute it, as well as the resulting terminal functions. Although the escape sequence is normally generated by the host computer, it may also be produced by striking the ESC key followed by the other specified keys.

> NOTE: If a feature requires use of the CTRL key or the SHIFT key, that key must be held down while the other specified key is pressed. The escape sequence keys are pressed in succession.

2.2   DESCRIPTION OF KEYS

Table 2-1 summarizes the functions of the keys and indicator added to the terminal keyboard under this option, while Figure 2-1 shows the keyboard layout. Note that the RECV PARITY ERROR indicator and RESET key of the standard terminal have been combined in a single key. Note also that the SCREEN ERASE key has been eliminated and its function replaced by the CONTROL and CLEAR keys operated together (see Section 2.4.6).

All the remaining keys and indicators function as described in Sections 2.3 through 2.5 and Paragraphs 2.2.1 through 2.2.23 below.

2.2.1   On-Off Switch

The ON-OFF switch is located in the extreme upper left corner of the keyboard panel. Press down on the upper end of the switch to turn the terminal on. Press down on the lower end to turn the terminal off.

2.2.2   Brightness Control

The BRIGHTNESS control is located next to the ON-OFF switch. Like the brightness control on a TV set, it controls the overall brightness of the white areas on the display screen.

For maximum brightness, move the control up until the stop is reached. For minimum brightness, move the control down until the stop is reached (dark screen).

Table 2-1. Key and indicator functions.

KEY/ INDICATOR	FUNCTION	REF. SECTION
SCROLL UP	Moves text displayed up one line	2.3.1
SCROLL DOWN	Moves text displayed down one line	2.3.2
NEXT PAGE	Moves text to display second page	2.3.3
PREV PAGE	Moves text to display first page	2.3.4
CHAR INSERT	Puts terminal in character insert mode to allow insertion of characters in existing text; also takes terminal out of character insert mode. Does not operate with terminal in KSR or protect mode. Indicator is on when terminal is in character insert mode.	2.4.1
CHAR DELETE	Deletes selected character in existing text. Operates with terminal in normal mode only.	2.4.2
CLEAR	Provides for Clear Line, Clear Screen, and Clear Memory functions.	2.4.5 2.4.6 2.4.7

There is no specific set-point for the brightness control. Continuous operation at a very high setting, however, can shorten CRT life. A recommended setting is one that makes the screen easy to read and comfortable for the eyes. Be sure to eliminate the raster.

2.2.3   Baud Rate Switch

The Baud Rate switch is located on the rear panel of the terminal. This switch sets the transmission rate for the modem interface (primary RS-232 Interface Card). Rates of 110, 300, 1200, 1800, and 2000 baud are selectable with this control.

NOTE: Terminals with 2400 baud option will have 2400 baud in place of 2000.
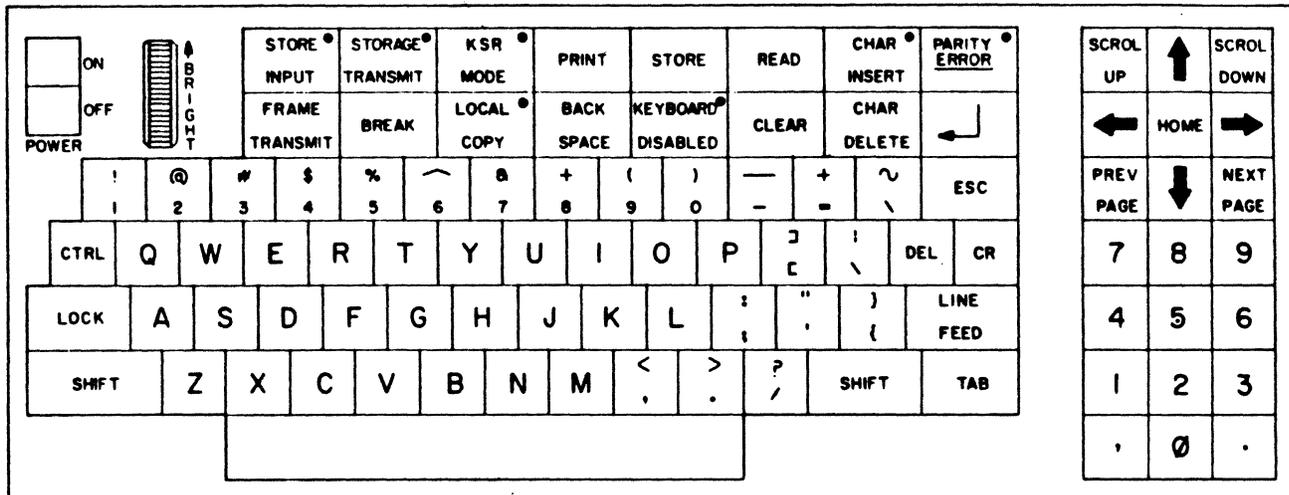
Figure 2-1. Keyboard layout.

2.2.4   Parity Switch

The Parity switch is also on the rear panel of the terminal. The setting of this switch establishes the parity mode for the modem interface of the terminal. Odd parity, even parity and parity off are selectable with this control. The Parity Switch controls both transmitted and received data.

When the switch is in the OFF position, all characters are transmitted with bit 8 low. (NOTE: Transmission with bit 8 high can be elected with a jumper option on the RS-232 Interface Card.) Parity in received characters is ignored.

With the switch in the ODD position, all characters are transmitted with odd parity; that is, bit 8 is set high when there is an even number of highs in bits 1 through 7. Received characters are checked for odd parity; that is, the number of highs in bits 1 through 8 is odd.

2.2.5   Visual Indicators

Indicator lights are built into six of the special function keys located in the two top rows of the left-hand key pad. Table 2-2 defines the on-off states for each indicator.

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Table 2-2. Visual Indicator On-Off States

INDICATOR	STATE	INDICATION
STORE INPUT	ON OFF	Store input function active Store input function inactive
STORAGE TRANSMIT	ON OFF	Transmit from auxiliary storage function active Transmit from auxiliary storage function inactive
KSR MODE	ON OFF	Terminal in KSR transmission mode Terminal in ASR transmission mode
KEYBOARD DISABLED	ON OFF	Terminal is busy; keyboard entries ignored except certain function keys (see text) Terminal available to keyboard
RECEIVED PARITY ERROR	ON OFF	Parity error detected in received characters No parity error detected
LOCAL COPY	ON OFF	Keyboard entries displayed (half duplex operation) Received data only displayed (full duplex operation)

2.2.6   STORE INPUT Key/Indicator

Pressing STORE INPUT (shifted or unshifted) to turn the indicator light on activates the store input function and disables the keyboard (KEYBOARD DISABLED indicator on). RESET and STORE INPUT remain enabled. All data received from the host system is placed in the auxiliary storage.

> NOTE: It may also be necessary to actuate a control on the storage device being used. For example, a TECHTRAN 4100 series tape cassette drive requires that the WRITE control be pressed to space the tape over the leader when the tape is on clear leader.

If the terminal is in KSR, this data is also displayed on the CRT screen. In ASR mode, the screen is not disturbed.

Pressing STORE INPUT (shifted or unshifted) to turn the indicator off switches the store input function off and enables the keyboard again.

2.2.7   STORAGE TRANSMIT Key/Indicator

Pressing this key (shifted or unshifted) to turn the indicator light on activates the storage transmit function and disables the keyboard (KEYBOARD DIS-ABLED indicator on). RESET and STORAGE TRANSMIT remain enabled. A record in the auxiliary storage is displayed on the screen and also transmitted to the host.

Pressing STORAGE TRANSMIT (shifted or unshifted) to turn the indicator off switches the storage transmit function off and reenables the keyboard. The keyboard is enabled after the last character in the record is transmitted.

2.2.8   KSR MODE Key/Indicator

Pressing KSR MODE (shifted or unshifted) to turn the indicator light on sets the terminal for KSR operation. Data entered from the keyboard is displayed on the screen and transmitted character-by-character to the host. Received data is also displayed. With parity on, a received parity error turns the RECEIVED PARITY ERROR indicator light on. Also, a backward question mark (ς) is displayed on the screen in place of the character.

Pressing KSR MODE (shifted or unshifted) to turn the indicator off sets the terminal to ASR mode.

> NOTE: The terminal will enter KSR mode only if a carrier
>   indication is being received from the communications
>   line.

2.2.9   PRINT Key

Pressing PRINT (shifted or unshifted) transfers data on the CRT screen to the printer and disables the keyboard. Data from the cursor home position (upper left corner of screen) to the cursor is printed. If the cursor is in its home position, the entire screen is printed. When the transfer is completed, the keyboard is reenabled.

2.2.10   STORE Key

Pressing STORE (shifted or unshifted) transfers data on the CRT screen to the auxiliary storage and disables the keyboard. Data from the cursor home position (upper left corner of screen) to the cursor is transferred. If the cursor is in its home position, the entire screen of data is transferred.

> NOTE: It may also be necessary to actuate controls on the
>   storage device being used. For example, a TECHTRAN
>   4100 series tape cassette drive requires that (1) the
>   WRITE control be pressed to space the tape over the
>   leader when the tape is on clear leader and (2) the
>   END MODE control be pressed if the drive just completed
>   a read command.

2.2.11   READ Key

Pressing READ (shifted or unshifted) transfers data from the auxiliary storage to the CRT screen and disables the keyboard. Data in storage will be read until a stop read command is transferred or the end of file is encountered on the medium. (The exact sequence depends on the characteristics of the storage device.)

NOTE: The host must supply the start and stop commands when
data was entered into the auxiliary storage with the
STORE INPUT function. Data entry with the STORE key
includes terminal-supplied start and stop command.

The keyboard is automatically enabled after the record
is transferred.

2.2.12   KEYBOARD DISABLED Indicator

When the light is on, keyboard input is not allowed. Exceptions
(explained earlier): RESET, STORE INPUT, and STORAGE TRANSMIT. That is, the
terminal will not accept key strokes. The keyboard is enabled when the indicator
is off.

2.2.13   RECEIVED PARITY ERROR Indicator

This key position serves only as an indicator, and it operates only if
parity is enabled (see paragraph 2.2.4). When the indicator is on, it signifies
that a parity error was detected in a received character.

NOTE: A " ٢ "is displayed on the CRT screen in place of the character.
The indicator stays on until it is cleared by a reset
function as described in paragraph 2.2.23.

2.2.14   FRAME TRANSMIT Key

Pressing FRAME TRANSMIT (shifted or unshifted) ASR transmits data on the
CRT screen to the host and disables the keyboard. Data from the cursor home posi-
tion (upper left corner of screen) to the cursor is transmitted. If the cursor is
in its home position, the entire screen is transmitted. The keyboard is automati-
cally enabled at the end of transmission.

2.2.15   LOCAL COPY Key/Indicator

This key is used only in KSR mode. The key directs data entries to both
the communications system and the display screen when pressed to turn the indicator
light on (LOCAL COPY on for half-duplex operation). If the light is off (LOCAL
COPY off for full-duplex operation) after pressing the key, data entries are sent
only to the communications line.

2.2.16   BREAK Key

Pressing this key places a 200-250 millisecond space on the communications
line. This key functions the same as the "interrupt" or "attention" key on other
terminals.

2.2.17   Control (CTRL) Key

The CTRL key, when used with an alphanumeric, punctuation, or symbol key
(shifted or unshifted), initiates a function or enters a character, as defined in

Table 2-3 or 2-4. The control key must be depressed first and held down while the other key, or keys, are operated.

2.2.18   SHIFT Key

This key shifts from lower case to upper case as on a typewriter. On dual character keys, it shifts from one character to another. Press the key to produce uppper case characters.

2.2.19   LOCK Key

This key locks the SHIFT key in the upper case position, as on a typewriter.

2.2.20   Space Bar

The space bar (at the bottom of the keyboard) functions as a typewriter space. Striking this key enters a space character into the terminal memory.

2.2.21   Delete (DEL) Key

Striking DEL generates the ASCII seven-bit delete (DEL) character.

2.2.22   BACK SPACE Key

Striking BACK SPACE moves the cursor one position to the left and transmits an ASCII backspace to the communications line.

2.2.23   Clear/Reset Functions

I/O Reset. Press CTRL and RESET at the same time to stop all input/output (I/O) operations. This action resets all I/O interfaces to off, sets the terminal to ASR mode, and resets the parity error indicator. It does not clear memory.

Master Clear (or Reset). Press, CTRL, SHIFT, and RESET at the same time to clear memory, position the cursor at its home position, reset all I/O interfaces, set the terminal to ASR mode, and clear parity error indicator. A master clear is performed automatically whenever the terminal is turned on.

Table 2-3.   8025AG terminal TTY ASCII control codes.

ACTION	CODE	SPECIAL FUNCTION KEY	CONTROL SEQUENCE (CTRL plus)
Null	NUL		[
Start of heading	SOH		a
Start of text	STX		b
End of text	ETX		c
End of transmission	EOT		d
Enquiry	ENQ		e
Acknowledge	ACK		f
Bell	BEL		g
Backspace	BS	BS	h
Horizontal tab	HT	TAB	i
Line feed	LF	LINE FEED	j
Vertical tab	VT		k
Form Feed	FF		l
Carriage return	CR	CR	m
Shift out	SO		n
Shift in	SI		o
Data link escape	DLE		p
Device control 1	DC1		q
Device control 2	DC2		r
Device control 3	DC3		s
Device control 4	DC4		t

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Table 2-3.   8025AG terminal TTY ASCII control codes (contd).

ACTION	CODE	SPECIAL FUNCTION KEY	CONTROL SEQUENCE (CTRL plus)
Negative Acknowledge	NAK		u
Synchronous idle	SYN		v
End of transmission block	ETB		w
Cancel	CAN		x
End of medium	EM		y
Substitute	SUB		z
Delete	DEL		
Escape	ESC	ESC	\
File separator	FS		/
Group separator	GS		{
Record separator	RS		=
Unit separator	US		DEL
Clear screen		SCREEN ERASE	
Master clear[1]			SHIFT+RESET
I/O reset			RESET
Frame transmit		FRAME TRANSMIT	
Next line		↵	
Store Input on		STORE INPUT (light on)	
Storage transmit on		STORAGE TRANSMIT (light on)	

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Table 2-3.   8025AG terminal TTY ASCII control codes (contd).

ACTION	CODE	SPECIAL FUNCTION KEY	CONTROL SEQUENCE (CTRL plus)
KSR mode on		KSR MODE (light on)	
Print on		PRINT	
Store on		STORE	
Read on		READ	
Local copy on		LOCAL COPY (light on)	
Local copy off		LOCAL COPY (light off)	
Break		BREAK	

Table 2-4. 8025AG terminal codes other than TTY ASCII codes.

FUNCTION	KEY(S)	OCTAL CODE	ESCAPE SEQUENCE
Scroll down	SCROLL DOWN	224	ESC SHIFT T
Scroll up	SCROLL UP	223	ESC SHIFT S
Next page	NEXT PAGE	225	ESC SHIFT U
Prev page	PREV PAGE	226	ESC SHIFT V
Clear memory	CONTROL SHIFT CLEAR	265	ESC SHIFT R
Clear screen (screen erase)	CONTROL CLEAR	325	ESC SHIFT J
Clear line	CLEAR or SHIFT CLEAR	245 or 305	ESC SHIFT K
Insert char on/off	CHAR INSERT or SHIFT CHAR INSERT	256 or 326	ESC SHIFT Q
Insert line	CONTROL SHIFT ,	214	ESC SHIFT L
Delete char	CHAR DELETE or SHIFT CHAR DELETE	246 or 306	ESC SHIFT P
Delete line	CONTROL SHIFT -	215	ESC SHIFT M
Enter prot mode	CONTROL 7	227	ESC SHIFT W
Enter normal mode	CONTROL 8	230	ESC SHIFT X
Start prot without auto tab	None	210	ESC h
Start prot with auto tab	None	230	ESC g
Start unprotected field	None	220	ESC i
Tab	TAB or SHIFT TAB or CONTROL I	011, 211	ESC SHIFT I
Back tab	CR or CONTROL SHIFT 7	015, 207	ESC SHIFT G

Table 2-4. 8025AG terminal codes other than TTY ASCII codes (contd).

FUNCTION	KEY(S)	OCTAL CODE	ESCAPE SEQUENCE
Cursor left	Left arrow or CONTROL SHIFT 4	204	ESC SHIFT D
Cursor right	Right arrow or CONTROL SHIFT 3	203	ESC SHIFT C
Cursor home	Home	210	ESC SHIFT H
Cursor up	Up arrow or CONTROL SHIFT 1	201	ESC SHIFT A
Cursor down	Down arrow or CONTROL SHIFT 2	202	ESC SHIFT B
Upper case on	CONTROL .		
Upper case off	CONTROL /		
Quote mode	CONTROL 1		
'CR' suppress on	CONTROL ;	233	ESC SHIFT N
'CR' suppress off	CONTROL 9	231	ESC SHIFT O
Read cursor		174	ESC SHIFT \
Position cursor		175	ESC SHIFT]
Normal video	None	200	ESC 4
Video off	None	201	ESC b
Underline on	None	202	ESC a
Reverse video	None	203	ESC 3
Dim video	None	204	ESC c
Dim reverse	None	205	ESC d
Blink	None	206	ESC e
Blink reverse	None	207	ESC f
Tab set	CONTROL SHIFT .	216	ESC 1
Tab clear	CONTROL SHIFT /	217	ESC 2

Table 2-4.   8025AG terminal codes other than TTY ASCII codes (contd).

FUNCTION	KEY(S)	OCTAL CODE	ESCAPE SEQUENCE
Proc ctrl chars	CONTROL ,	234	ESC SHIFT Y
Blank-out ctrl chars	CONTROL '	232	ESC SHIFT Z
KB lock	CONTROL SHIFT 5	205	ESC SHIFT E
KB unlock	CONTROL SHIFT 6	206	ESC SHIFT F

2.3   SCROLL FEATURES

The scroll features make it possible to move the display window in either direction over the entire 48-line display memory as described below. The scroll features may be used in either normal or protect field mode.

2.3.1   Scroll Up

Key: SCROLL UP

Escape Sequence: ESC SHIFT S

Functions

1. Moves display window down one line over display memory so that text appears to move up, i.e., text on line 1 of window goes off screen, following 23 lines move up one line, and next line in memory appears as new line 24 at bottom of screen.

2. Cursor location in display memory does not change. If located in line 1 of window, it goes off screen with the line; if located in display memory line right after line 24 of window, it comes into view.

3. If display window is at logical end of memory, no action takes place and terminal beeps.

2.3.2   Scroll Down

Key: SCROLL DOWN

Escape Sequence: ESC SHIFT T

Functions

1. Moves display window up one line over display memory so that text appears to move down; i.e., text on line 24 of window goes off screen, preceding 23 lines move down one line, and display memory line that immediately preceded line 1 of window appears as new line 1 at top of screen.

2. Cursor location in display memory does not change. If located in line 24 of window, it goes off screen with line; if located in display memory line just before line 1 of window, it comes into view.

3. If display window is at logical beginning of memory, no action takes place and terminal beeps.

2.3.3   Page Forward

Key: NEXT PAGE

Escape Sequence: ESC SHIFT U

Functions

1. Moves display window forward to lines 25 through 48 of display memory.

2. Cursor location in display memory does not change and may, therefore, go off screen.

2.3.4   Page Backward

Key: PREV PAGE

Escape Sequence: ESC SHIFT V

Functions

1. Moves display window backward to lines 1 through 24 of display memory.

2. Cursor location in display memory does not change and may, therefore, go off screen.

2.4   EDIT FEATURES

The edit features make it possible to add or delete characters or lines in existing text and to perform a number of text clearing operations, as described below. Except for the clearing functions, the edit features are operable in normal mode only. If an attempt is made to use them in protect field mode (see Section 2.5), no action takes place and the terminal beeps.

2.4.1   Insert Character

Key: CHAR INSERT

Escape Sequence: ESC SHIFT Q

Functions

1. Pressing CHAR INSERT key, to turn indicator on, enables terminal for character insert operation; terminal remains in character insert mode until CHAR INSERT key is pressed to turn indicator off.

2. With terminal in character insert mode, pressing any graphic (displayable) character key causes (a) cursor and following text on line to move one position to right, and (b) input character to be inserted in position vacated by cursor.

NOTE: Only line containing cursor is affected and any text
          moved past column 80 at right is lost. When cursor
          moves past column 80, it goes to column 1 in next line.

3. If cursor is off screen, no action takes place and terminal beeps.

2.4.2   Delete Character

Key: CHAR DELETE·

Escape Sequence: ESC SHIFT P

Functions

   1. Deletes character above cursor and moves following text on line one position to the left.

   2. If cursor is in column 80 or off screen, no action takes place and terminal beeps.

2.4.3   Insert Line

Keys: CONTROL with SHIFT and , (comma)

Escape Sequence: ESC SHIFT L

Functions

   1. Moves entire line of text containing cursor, as well as all following lines in display memory, one line down leaving line vacated blank.

   NOTE: Old last line in memory is lost.

   2. Cursor position remains unchanged (i.e., moves with text). If cursor is off screen, no action takes place and terminal beeps.

   3. If insert line request is followed by delete line request (see Par. 2.4.4), then in effect last line in memory is cleared and remainder of display memory remains unchanged.

2.4.4   Delete Line

Keys: CONTROL with SHIFT and - (dash)

Escape Sequence: ESC SHIFT M

Functions

   1. Deletes entire line of text containing cursor and moves all following lines in display memory up one line leaving last line in memory blank.

   2. Cursor is not moved. If cursor is off screen, no action takes place and terminal beeps.

   3. If delete line request is followed by insert line request (see Par. 2.4.3), line containing cursor is cleared and remainder of display memory remains unchanged.

2.4.5   Clear Line

Key: CLEAR

Escape Sequence: ESC SHIFT K

Normal Mode Functions

1. Clears text from cursor position to end of line.

2. Cursor is not moved. If cursor is off screen, no action takes place and terminal beeps.

Protect Field Mode Functions

1. Clears text in unprotected field from cursor position to end of unprotected field or end of line, whichever comes first.

2. Cursor is not moved. If cursor is off screen, no action takes place and terminal beeps.

2.4.6   Clear Screen

Keys: CONTROL and CLEAR

Escape Sequence: ESC SHIFT J

Normal Mode Functions

1. Clears all text in display window.

2. Returns cursor to home position (i.e., beginning of line 1 on screen).

Protect Field Mode Functions

1. Clears all unprotected fields in display window.

2. Moves cursor to beginning of first unprotected field displayed.

2.4.7   Clear Memory

Keys: CONTROL with SHIFT and CLEAR

Escape Sequence: ESC SHIFT R

Normal Mode Functions

1. Clears display memory from cursor position to logical end of memory.

2. Cursor is not moved. If cursor is off screen, no action takes place and terminal beeps.

Protect Field Mode Functions

1. Moves display window to logical beginning of memory and clears all unprotected fields in display memory.

2. Moves cursor to beginning of first unprotected field in display memory.

2.5   PROTECT FIELD MODE FEATURES

The operating features described in this section make it possible to set up and use a form in display memory in which the titles or legends (e.g., Name, Address, Age, etc.) are defined as protected fields, while the areas in which variable data is entered are defined as unprotected fields.

A form is always set up in display memory with the terminal in normal mode. This is done by means of special control characters sent by the host computer or entered from the keyboard or retrieved from the auxiliary storage device. These control characters are used to define the fields as protected or unprotected, to provide various video attributes, and to perform other functions needed in setting up the form.

Once the form is set up in display memory, the terminal may be placed in the protect field mode. In this mode the cursor cannot be placed within any protected field, and thus data can be entered only in the unprotected fields. All of the features described in Sections 2.5.3 through 2.5.10 and 2.5.15 through 2.5.24, as well as the clear functions (see Sections 2.4.5 through 2.4.7), may be used in the protect field mode.

2.5.1   Formatting Display Memory

As previously mentioned, with the terminal in normal mode, a protected-field format can be set up in display memory by entering various field definition and video attribute characters in the appropriate spaces as required.

Initially, the entire display memory is automatically defined as protected. That is, if switched to the protect field mode, it would act as if a "start protected field without auto tab" control character precedes each line. Consequently, a format should always be loaded into memory before the terminal is switched to protect field mode. If this is not done, the terminal will go into an endless loop looking for an unprotected field, and the only keyboard function it will respond to in such a case is I/O reset or master reset.

The basic procedure for setting up a protected field format in display memory is outlined below. The control functions referred to are described in subsequent paragraphs.

1. If the terminal is in protect field mode (indicated by a blinking block cursor) reenter normal mode as described in Section 2.5.3.

NOTE: The terminal also goes into normal mode when it is turned on or when a reset function is executed; see Section 2.2.23.

2. Enter field definition characters (Sections 2.5.4 through 2.5.6) and video attributes (Section 2.5.16) as required, keeping in mind the following:

    a. Each field definition character occupies one byte in memory and appears as a blank space (or video control character) on the screen. Note that a field definition character and a video control character can occupy the same character position in memory, even though entered sequentially (i.e. with no back-space).

    b. Each field definition character controls the positions that follow it.

    c. The field definition characters are line oriented (i.e., define all following positions to the end of the line or to the next field definition character, whichever comes first).

3. Along with the field definition characters, enter the required form text (titles, legends, etc.) into the protected fields. Note that sample data may also be entered into the unprotected fields at this time to help design the form.

4. When the form is completed, the terminal may be switched to protect field mode, as described in Section 2.5.2, in readiness for data entry (see Section 2.4.7).

2.5.2   Enter Protect Field Mode

     <u>Keys</u>: CONTROL and 7

     <u>Escape Sequence</u>: ESC SHIFT W

     <u>Functions</u>

     1. Switches terminal to protect field mode.

     2. Moves display window to logical beginning of memory.

     3. Changes cursor from blinking underline to blinking block and moves cursor to beginning of first unprotected field.

2.5.3   Reenter Normal Mode

     <u>Keys</u>: CONTROL and 8

     <u>Escape Sequence</u>: ESC SHIFT X

     <u>Functions</u>

     1. Switches terminal to normal mode.

     <u>NOTE</u>: Entire display memory becomes accessible for data entry and any existing format is no longer protected.

2. Changes cursor from blinking block to blinking underline. Cursor position remains unchanged.

2.5.4   Start Protected Field Without Auto Tab

<u>Keys</u>: None

<u>Escape Sequence</u>: ESC h

<u>Functions</u>

1. Defines following character positions as a protected field.

2. An attempt to move cursor into this field definition character (in protect field mode) causes terminal to reject data entry and to beep. Cursor can be moved for further data entry by Cursor Left, Tab, or Back Tab functions (or by escape sequence for any function legal in protect field mode).

2.5.5   Start Protected Field With Auto Tab

<u>Keys</u>: None

<u>Escape Sequence</u>: ESC g

<u>Functions</u>

1. Defines following character positions as a protected field.

2. An attempt to move cursor into this field definition character (in protect field mode) causes cursor to jump to beginning of next unprotected field.

2.5.6   Start Unprotected Field

<u>Keys</u>: None

<u>Escape Sequence</u>: ESC i

<u>Function</u>

Defines following character positions as an unprotected field.

> <u>NOTE</u>:   Since the Start Unprotected Field character is line
> oriented, it must be entered at the beginning of each
> succeeding line of a multiline unprotected field.

2.5.7   Data Entry in Protect Field Mode

In protect field mode, the cursor will rest only within unprotected fields and data may be entered in these fields as required. After the last position in an unprotected field, the cursor will either jump to the beginning of the next unprotected field or the terminal will beep until the cursor is tabbed over. The action

depends on the field definition character used for the following protected field (see Sections 2.5.4 and 2.5.5).

The Cursor Left, Cursor Right, Tab and Back Tab functions may be used as required to move to different parts of the form. Note that the Cursor Up and Cursor Down functions, as well as Tab Set and Tab Clear, are inoperative in protect field mode. The Cursor Left, Cursor Right, and Cursor Home functions in normal mode are as described in the standard 8025G manual.

2.5.8   Cursor Left

Keys: LEFT ARROW (←), or CONTROL with SHIFT and 4

Escape Sequence: ESC SHIFT D

Functions (Protect field mode)

1. Moves cursor one character position to left if cursor is not at beginning of an unprotected field.

2. If cursor is at beginning of an unprotected field, cursor does not move and terminal beeps.

3. If cursor is off screen, no action takes place.

2.5.9   Cursor Right

Keys: RIGHT ARROW (→), or CONTROL with SHIFT and 3

Escape Sequence: ESC SHIFT C

Functions (Protect field mode)

1. Moves cursor one character position to right if cursor is not at the. end of an unprotected field.

2. If cursor is at the end of an unprotected field and following position contains a Start Protected Field With Auto Tab control character, cursor moves to beginning of next unprotected field. If control character is a Start Protected Field Without Auto Tab, cursor does not move and terminal beeps.

3.   If cursor is off screen, no action takes place.

2.5.10   Cursor Home

Key: HOME

Escape Sequence: ESC SHIFT H

Function: (Protect field mode)

Moves cursor to beginning of first unprotected field in display window.

2.5.11   Cursor Up

Keys: UP ARROW (↑), or CONTROL with SHIFT and 1

Escape Sequence: ESC SHIFT A

Functions (Normal mode only)

1.   Moves cursor up one line.

2.   If cursor is in first line of display window, display window moves up (scrolls) one line.

3.   If cursor is in first line of display window and window is at logical beginning of memory, no action takes place and terminal beeps.

2.5.12   Cursor Down

Keys: DOWN ARROW (↓), or CONTROL with SHIFT and 2

Escape Sequence: ESC SHIFT B

Functions (Normal mode only)

1.   Moves cursor down one line.

2.   If cursor is in last line of display window, display window moves down (scrolls) one line.

3.   If cursor is in last line of display window and window is at logical end of memory, no action takes place and terminal beeps.

2.5.13   Tab Set

Keys: CONTROL with SHIFT and . (period)

Escape Sequence: ESC 1

Functions (Normal mode only)

1.   Sets tab stop in column indicated by cursor position. Total of 80 tab stops may be set across display memory. If total has been reached, terminal beeps.

2.   No cursor movement or text modification takes place.

2.5.14   Tab Clear

Keys: CONTROL with SHIFT and / (slant line)

Escape Sequence: ESC 2

Functions (Normal mode only)

1. Clears tab stop in column indicated by cursor position.

2. No cursor movement or text modification takes place.

2.5.15   Tab

Keys: TAB, or CONTROL and i

Escape Sequence: ESC SHIFT I

Normal Mode Functions

1. Moves cursor to next tab stop.

2. If cursor is at last tab stop on a line, cursor moves to beginning of
next line. If next line is off screen, display window moves down (scrolls) one line.

>   NOTE: If display window is at logical end of memory, next line
>   in scroll is created by erasing first line in display
>   memory as described in Section 1.2.

3. If cursor is off screen, no action takes place and terminal beeps.

Protect Field Mode Functions

1. Moves cursor to beginning of next unprotected field.

2. If cursor is in last unprotected field in display memory, display window
moves to logical beginning of memory and cursor moves to beginning of first unprotected
field.

3. If cursor is off screen, no action takes place and terminal beeps.

2.5.16   Back Tab

Keys: CR (carriage return), or CONTROL with SHIFT and 7

Escape Sequence: ESC SHIFT G

Normal Mode Functions

See Section 3.7.21 in 8025G Maintenance Manual.

Protect Field Mode Functions

1. Moves cursor back to beginning of unprotected field cursor resides in.

2. If cursor is at beginning of an unprotected field, cursor moves back to
beginning of preceding unprotected field.

3. If cursor is at beginning of first unprotected field in display memory, cursor moves briefly to logical beginning of memory, terminal beeps, and cursor bounces back to original position.

2.5.17   Video Attributes

In setting up a protected format in display memory, control characters for various video attributes may be entered along with the field definition characters. Like the latter, the video attribute characters are line oriented. That is, each one controls all the following positions to the end of the line or to the next video attribute or field definition character, whichever comes first.

Each video attribute and/or field definition character occupies one byte in memory. In other words, one character of each type either singly or together takes up one position on the CRT screen. Any combination of video attribute and field definition characters may be used, and they may be entered in any order.

Table 2-5 lists the video attributes available and, for convenience, the protect field control characters. Note that each may be entered only by means of an escape sequence, either from the host computer or through the keyboard. Note also that initially, in normal mode, the beginning of each line is automatically set for Normal Video and Start Protected Field Without Auto Tab.

2.5.18   Transmit Non-Protect Fields

Keys: PRINT, STORE, or FRAME TRANSMIT

Escape Sequence: PRINT - ESC P
                    STORE - ESC s
                    FRAME TRANSMIT - ESC t

Functions (Protect field mode)

1. Keyboard is locked.

2. Display memory is back-scanned (through all fields) from cursor position to logical beginning of memory, or until ASCII control character STX or ETX is encountered. Memory is then forward-scanned with each character (including spaces and control characters) in each unprotected field transferred to the previously selected I/O address. Scan continues until logical end of display memory, or control character STX or ETX, is encountered. The EOT character (004_8) is transmitted.

3. Cursor follows both back-scan and forward scan. No carriage returns, line feeds, or other characters are generated except EOT.

4. As the scan searches through protected fields, any imbedded "control characters" (000_8 - 037_8) excepting "RS", "LF", "ETX", and "STX" within the protected fields will be transmitted. Thus, a means of identifying ends/beginnings of individual data fields is provided, as is a means of supplying a special record terminating character to the receiving device.

In addition, a "literal string" may be transmitted from a protected field under the following conditions: (a) the literal string will be identified by the

Table 2-5. *Video attributes and protect field control characters.*

CONTROL CHARACTER	ESCAPE SEQUENCE
Normal Video	ESC 4
Reverse Video	ESC 3
Underline On	ESC a
Video Off	ESC b
Dim Video	ESC c
Dim Reverse	ESC d
Blink	ESC e
Blink Reverse	ESC f
Start Protected Field With Auto Tab	ESC g
Start Protected Field Without Auto Tab	ESC h
Start Unprotected Field	ESC i

control character RS (036₈); (b) the remainder of the protected field will be transmitted to the next field identifier, an ETX or STX, or logical end of memory, whichever comes first. This capability allows for format or record identifiers to be permanently placed within a protected form and recorded with the data entered into that form.

5. When cycle is completed, keyboard is unlocked and I/O address is deactivated.

> NOTE: To transmit entire form including protected fields, terminal must be placed in normal mode before required transfer function is keyed.

2.5.19   Suppress CR (Carriage Return) Display

<u>Keys</u>: CONTROL and ; (semicolon)

<u>Escape Sequence</u>: ESC SHIFT N

<u>Function</u>

Inhibits CRT display of any carriage return characters generated. Removes any CR and other control characters displayed on screen.

2.5.20   Enable CR (Carriage Return) Display

<u>Keys</u>: CONTROL and 9

<u>Escape Sequence</u>: ESC SHIFT O

<u>Function</u>

Allows carriage return characters and control characters to be displayed on CRT screen.

2.5.21   Process Control Characters

<u>Keys</u>: None

<u>Escape Sequence</u>: ESC SHIFT Y

<u>Function</u>

Causes control characters to be displayed on CRT screen.

> NOTE: No control characters can be displayed if suppress CR display function has been executed; see Section 2.5.19.

2.5.22   Blank-Out Control Characters

<u>Keys</u>: None

Escape Sequence: ESC SHIFT Z

Function

Keeps control characters from being displayed on CRT screen.

2.5.23   Keyboard Lock

Keys: CONTROL and SHIFT 5

Escape Sequence: ESC SHIFT E

Function

Disables keyboard operation; striking keys causes terminal to beep.

NOTE: Keyboard Lock/Unlock functions are normally controlled by host
         computer. With keyboard locked, the only manually executed
         function to which the terminal will respond is I/O reset;
         see Section 2.2.23.

2.5.24   Keyboard Unlock

Keys: CONTROL and SHIFT 6

Escape Sequence: ESC SHIFT F

Function

Restores keyboard operation after Keyboard Lock function has been executed.

2.5.25   Quotation Mode

Keys: CONTROL and 1

Escape Sequence: None

Function

       Causes all character codes generated at the keyboard to be placed into the
display memory without interpretation except for function keys and display control
keys. That is, any code from 000_8 through 127_8 will result in a character display on
the display screen. For instance, the CR key causes a left arrow to be displayed,
and the cursor moves to the next logical character position instead of to column 1.

       This function is useful as a "literal mode" for communications analysis and
diagnostics. It is useful also for setting up ESC sequences to be transmitted to a
computer or storage unit, as when a format is being defined for storage and later use
in data entry.

2.5.26   Upper Case Alpha Mode On

Keys: CONTROL and . (period)

Escape Sequence: None

Function

All alphabetic characters keyed at the keyboard are encoded and displayed
in the upper case ASCII code and form, regardless of the position of the upper case
shift key. No other function is changed in any way.

2.5.27   Upper Case Alpha Mode Release

Keys: CONTROL and / (slant line)

Escape Sequence: None

Function

Causes the upper case mode to be terminated. Both upper case and lower
case characters and code are processed normally and without change.

3.1 INTRODUCTION

This section describes the physical changes made in the standard 8025G terminal to incorporate the present option features. The items modified are the PROM card, Buffered RAM (Refresh) Memory card, Refresh Control card, and Keyboard. All other parts of the terminal remain the same as described in the 8025G Maintenance Manual.

3.2 PROM CARD

Refer to Section 4.4.5 in the 8025G Maintenance Manual. The PROM card in the modified terminal carries a full complement of 32 memory chips for a total of 4096 bytes of program memory. The chip locations on the PROM card and corresponding memory addresses are given in Table 3-1 below. Note that address sector 0 includes all memory addresses from 0_8 to 7777_8.

Table 3-1. PROM chip locations and memory addresses.

CHIP LOCATION (Reference Designation)		MEMORY ADDRESS
MOST SIGNIFICANT BITS	LEAST SIGNIFICANT BITS	(Octal)
XD1	XB1	00000-00377
XD2	XB2	00400-00777
XD3	XB3	01000-01377
XD4	XB4	01400-01777
XD5	XB5	02000-02377
XD6	XB6	02400-02777
XD7	XB7	03000-03377
XD8	XB8	03400-03777
XC1	XA1	04000-04377
XC2	XA2	04400-04777
XC3	XA3	05000-05377
XC4	XA4	05400-05777
XC5	XA5	06000-06377
XC6	XA6	06400-06777
XC7	XA7	07000-07377
XC8	XA8	07400-07777

3.3 BUFFERED RAM (REFRESH) MEMORY CARD

Refer to Section 4.4.6 in the 8025G Maintenance Manual. The refresh memory card in the modified terminal contains a full complement of 32 memory chips for a total of 4096 bytes (48 lines or 2 pages) of display memory. The RAM chip locations and corresponding memory addresses are given in Table 3-2 below. Note that address sector 3 includes all memory addresses from $30,000_8$ to $37,777_8$.

Table 3-2. RAM chip locations and memory addresses.

CHIP LOCATION (Ref. Desig.)								MEMORY ADDRESS (Octal)
BIT POSITIONS								
7	6	5	4	3	2	1	0	
XA8	XA7	XA6	XA5	XA4	XA3	XA2	XA1	30000-31777
XB8	XB7	XB6	XB5	XB4	XB3	XB2	XB1	32000-33777
XC8	XC7	XC6	XC5	XC4	XC3	XC2	XC1	34000-35777
XD8	XD7	XD6	XD5	XD4	XD3	XD2	XD1	36000-37777

3.4 REFRESH CONTROL CARD

Refer to Section 4.4.8 in the 8025G Maintenance Manual. The refresh control card in the modified terminal (see drawing 96-457-02 in this manual) incorporates one minor wiring change. Pin 6 of NAND gate XB5 is connected to pin 12 of XC4 instead of to pin 14 of XC5 as in the standard terminal. This changes the end of memory address (memory seam) decoded by XB5 and XB6.

3.5 KEYBOARD

Refer to Section 4.4.11 in the 8025G Maintenance Manual. To accommodate the new and revised key functions, the X-Y matrix switches on the keyboard card of the modified terminal are assigned as shown in Table 3-3. The indicator functions of the LED-assembly diodes are as listed in Table 3-4. In all other respects, the keyboard circuitry is the same as in the standard 8025G terminal.

Table 3-3. X-Y matrix switch assignments.

SWITCH NUMBER	FUNCTION
2,13	Shift
14	Tab
15	Lock
28	Line feed
29	Control
42	Delete
43	Carriage return
57	Escape
58-69	Numeric pad*
70	Prev. page
71, 73-75, 77	Cursor Control
72	Next page
76	Scroll up
78	Scroll down
79-86	Special functions
53	Not used**
87-94	Special functions
Remainder	Alphabetic typewriter keys

* Numeric pad is omitted on 12 line display terminal.
** Switch and key remain active but are inhibited by software.

Table 3-4. LED keyboard indicators.

DIODE	ON/OFF STATE INDICATION	KEY ILLUMINATED
CR1	On: Parity error in received data. Off: No parity errors.	RECV PARITY ERROR
CR2	On: Terminal in character insert mode. Off: Terminal in normal character entry mode.	CHAR INSERT
CR3-5	Not used.	---
CR6	On: KSR transmission mode. Off: Terminal not in KSR mode.	KSR mode
CR7	On: Data from auxiliary storage is arriving at terminal. Off: Auxiliary storage not connected.	STORAGE TRANSMIT
CR8	On: Terminal is receiving data and transmitting it to auxiliary storage. Off: Store input function inactive.	STORE INPUT
CR9-11	Not used.	---
CR12	On: Terminal busy. Off: Terminal available.	KEYBOARD DISABLED
CR13	Not used.	---
CR14	On: Local copy on (half-duplex). Off: Local copy off (full-duplex).	LOCAL COPY
CR15-16	Not used.	---