

Qume
A Subsidiary of ITT

QVT

103™

Operator Manual



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WARNING

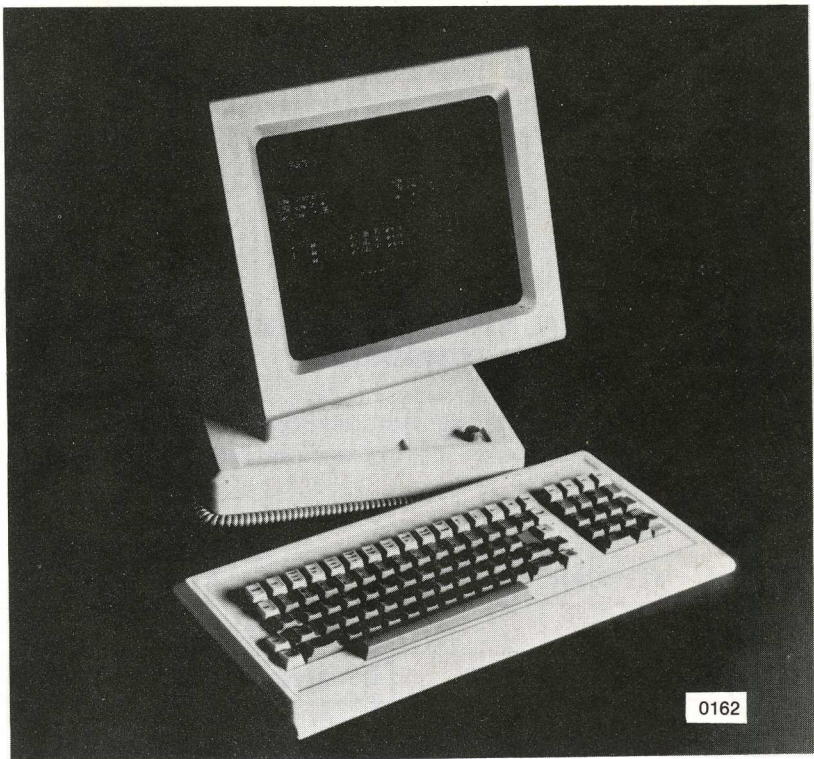
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The QVT-103 Video Display Terminal

PREFACE

The purpose of this manual is to describe the QVT-103™ (or Qume Video Terminal - Model 103), its proper use, capabilities, and features. Even though its application may vary, users of the QVT-103 are encouraged to read this manual to acquire a general understanding and thereby facilitate using the terminal to its fullest potential. The keyboard and display module, the two major components that comprise the terminal, are illustrated above.

Following the PREFACE is a section entitled PRODUCT DESCRIPTION, which outlines the specifications of the terminal. Next, in the section entitled INSTALLATION, detailed instructions for unpacking and installing the terminal are presented. The next section, OPERATION, is perhaps the most important section, because it describes the power-on procedure, set-up, and general operator functions. The PROGRAMMER INFORMATION section is more

technically oriented and explains the terminal's command set and programmable function keys. The COMMUNICATIONS section provides a detailed explanation of data communication and terminal interface requirements. A GLOSSARY and APPENDIX provide an array of reference information, and an INDEX concludes the manual with a topical listing of keywords with page reference.

RECORD THE SERIAL NUMBER AND MODEL NUMBER OF YOUR KEYBOARD AND DISPLAY MODULE

The serial number and model number for both the keyboard and display module are located on the bottom outside cover of each component.

KEYBOARD		DISPLAY MODULE	
Model Number		Model Number	
Serial Number		Serial Number	

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PRODUCT DESCRIPTION

INTRODUCTION

This section tabulates the specifications of the QVT-103 video terminal.

SCREEN/VIDEO DISPLAY

Display Module	<ul style="list-style-type: none">•14-inch diagonal screen.•Tilt and swivel for individual operator comfort.•Standard non-glare green screen (with optional non-glare amber).
Display Format	<ul style="list-style-type: none">•24 lines by 80/132-character columns.•25th Status/Setup Line.
Character Formation	<ul style="list-style-type: none">•7 x 9 matrix in a 10 x 12 cell (for 80 column mode).•7 x 9 matrix in a 9 x 12 cell (for 132 column mode).
Video Attributes	<ul style="list-style-type: none">•Blink, Underline, Normal/Reverse Video, and Bold.
Cursor Type	<ul style="list-style-type: none">•Blink/Steady, Block/Underline, or Invisible.
Fields	<ul style="list-style-type: none">•Protected and Unprotected Fields.

KEYBOARD

Keyboard	<ul style="list-style-type: none">•Detached, adjustable-tilt, low profile (home row is 30 mm from work surface) for enhanced individual operator comfort.•Alphanumeric typewriter character set.•12 User-programmable functions.•14 key numeric pad.•Defeatable audible key click and character auto repeat.•Print, Setup, and No-Scroll keys.•Keyboard lock enable/disable.
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KEYBOARD (cont)

- Character Set
- Standard character sets are US, UK, French, Spanish, and German.
 - 96 ASCII characters per set.
 - 32 special graphics characters.
 - 32 control characters.

FEATURES

- Emulations
- In addition to its own QVT-103 command set, three emulations are available: Digital VT131, VT100, and VT52.
- Editing
- Cursor position/movement keys: Home, Up, Down, Left, Right.
 - Character/Line Insert and Delete.
 - Erase Functions:
 - Erase to cursor
 - Erase from cursor
 - Erase Line/Page
 - Erase all
 - Erase unprotected
 - Tabbing: Tab, Back Tab, Field Tab.
 - Clear Space, Next Page, Previous Page, and Horizontal Split Screen.
- Rear Panel (Display Module Pedestal) Features
- Power On/Off switch.
 - Line Fuse: Standard 2 amp - 250 Vac.
 - AUX - Auxiliary (printer) interface connector, DB-25 male.
 - EIA - Host computer (RS232-C) interface connector, DB-25 male.
- Screen Intensity
- Adjustable screen intensity from potentiometer on right front corner of the display module pedestal.
- Keyboard Connection
- Keyboard quick connect/disconnect from telephone style connector on left-side corner of the display module pedestal.

FEATURES (cont)

Screen-Saver	<ul style="list-style-type: none"> • Automatic video disable after approximately 15 minutes of inactivity with no loss of data. Depressing any key or receiving data reactivates the video display. This feature can be disabled.
Setup Mode	<ul style="list-style-type: none"> • Menu style (25th status line) setup feature with non-volatile memory (lithium battery with minimum 7-year life).
Character Sets	<ul style="list-style-type: none"> • English (US), United Kingdom, French, German, and Spanish - standard.
Screen Memory	<ul style="list-style-type: none"> • Standard two pages of 80 columns/ one page of 132 columns; expandable to four pages of 80 columns/ two pages of 132 columns.
Scrolling	<ul style="list-style-type: none"> • Jump or smooth.

COMMUNICATIONS

Interface	<ul style="list-style-type: none"> • EIA RS232-C interface standard, optional 20 mA current loop. • Bidirectional printer (AUX) port.
Protocol	<ul style="list-style-type: none"> • Auto XON/XOFF.
Modes	<ul style="list-style-type: none"> • Full-duplex (control host, modem, or asymmetric modem). • Half-duplex (control host, coded).
Baud Rates	<ul style="list-style-type: none"> • 50, 75, 110, 134.5, 150, 300, 600, 1200, 1800, 2000, 2400, 3600, 4800, 7200, 9600, and 19200.

PRODUCT DESCRIPTION

COMMUNICATIONS (cont)

Auxiliary Port	• Bidirectional EIA RS232-C, XON/XOFF, buffered, auto print, screen copy, transparent.
Parity	• Odd, Even, Mark, Space, or None.
Data Word Size	• 7- or 8-data bits (8 bit mark and space parity not allowed).

POWER REQUIREMENTS

Power Requirements	• 95 to 125 Vac, 0.30 A • 200 to 264 Vac, 0.15 A • 50/60 Hz, 35 W
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PHYSICAL

Dimensions	• Display Module: 14 1/2 inches high, 13 1/2 inches wide, 12 inches deep. • Keyboard: 1 1/2 inches high, 18 inches wide, 8 inches deep.
Weight	• Display Module: 20 pounds. • Keyboard: 3 pounds.
Operating Temperature	• 10 to 40 degrees Centigrade (50 to 104 degrees Fahrenheit).
Relative Humidity	• 10 to 90% (non-condensating).

OPTIONS

Options	• 4 page display option (2 page standard). • Non-glare amber screen. • Passive 20-mA current loop communications interface (can be reconfigured for active).
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INSTALLATION

INTRODUCTION

This section describes receiving/inspection and installation of the QVT-103 video terminal.

RECEIVING / INSPECTION

Each terminal is packaged in an individual carton for protection during shipment.

Before opening the carton, inspect it for any signs of damage. If damage is observed, have the delivery agent note the damage on the shipping document. Note: Some shippers may wish to be present when the carton is opened, if external damage is apparent.

Unpack and inspect the terminal as follows. Refer to Figure 2-1.

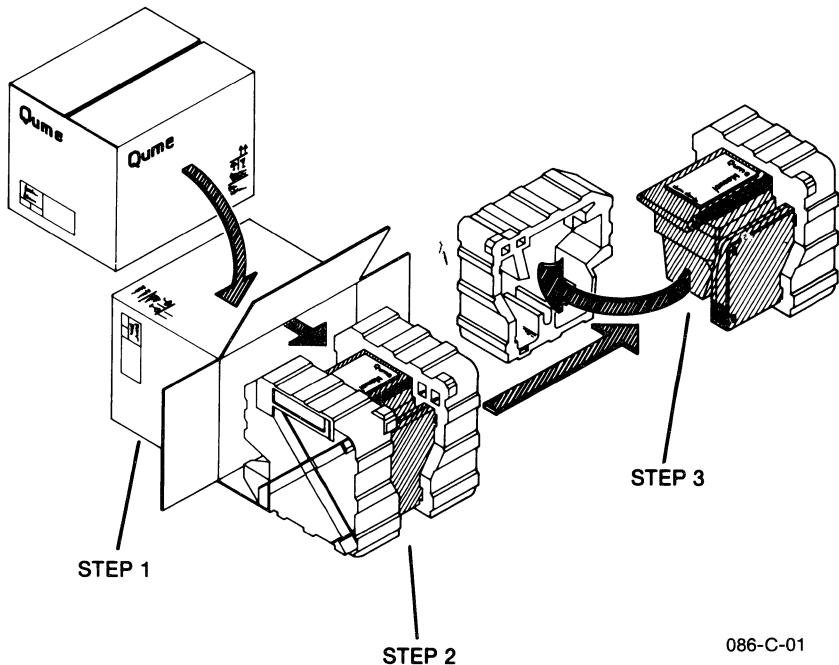


Figure 2-1. Unpacking the Terminal

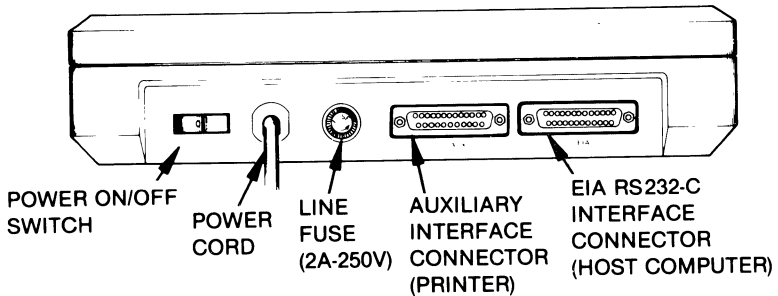
INSTALLATION

1. Open the carton and place it on its side on a table top or flat surface.
2. Slide the terminal from the carton.
3. Remove the Styrofoam packing buns, being careful that neither the keyboard or display module are jostled and fall.
4. Remove the plastic bags that wrap each component. Retain all packaging materials for possible reshipment.
5. Inspect both the display module and the keyboard for scratches, loose parts, and damage from rough handling. Note any evidence of such damage on the invoice, and file a claim with the carrier immediately if the condition of either component so warrants.
6. If damage that might impair the proper operation of the terminal is detected, contact your service representative for advice and instructions.
7. If the terminal will not be used for some time, it is advisable to replace the plastic shipping bags for dust protection.
8. When repacking the terminal for shipment or for long storage periods, use only the original packaging materials.

INSTALLATION

Select a suitable site in which to install your terminal. A good site offers a clean, well-lighted environment, with a stable platform to support the terminal at a comfortable height. Install the terminal as follows:

1. Verify that the Power Switch on the rear panel of the display module pedestal is in the OFF position. The rear panel of the display module pedestal is illustrated in Figure 2-2.



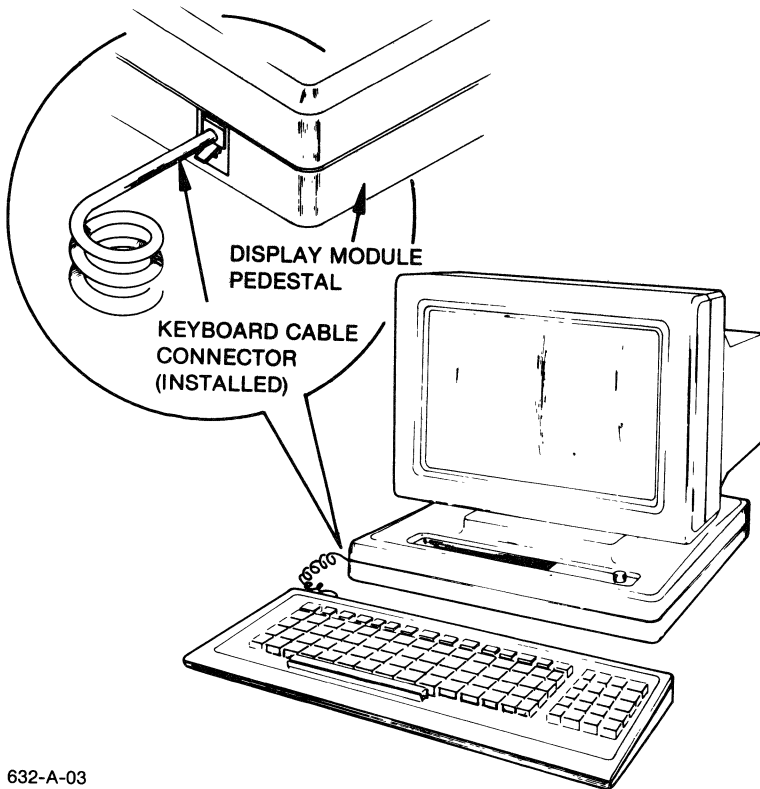
191-B-02

Figure 2-2. The Rear Panel of the Display Module Pedestal

2. Connect the communications cable between the host computer and the connector labeled "EIA" on the rear panel of the display module pedestal. If necessary, refer to Appendix A for a pinout description of this connector, and for information concerning optional interface jumper placement.
3. If a printer is to be used, connect the printer to the connector labeled "AUX" on the rear panel of the display module pedestal. If necessary, refer to Appendix A for a pinout description of this connector.
4. Connect the power cord from the display module to a grounded AC outlet. Verify that the terminal rating and AC line voltage are compatible.

INSTALLATION

5. Connect the coiled keyboard cable to the connector on the left front corner of the display module pedestal (refer to Figure 2-3).
6. If necessary adjust the height of the keyboard using the two feet located on the underside of the keyboard.



632-A-03

Figure 2-3. Keyboard Cable Connection to the Display Module

OPERATION

INTRODUCTION

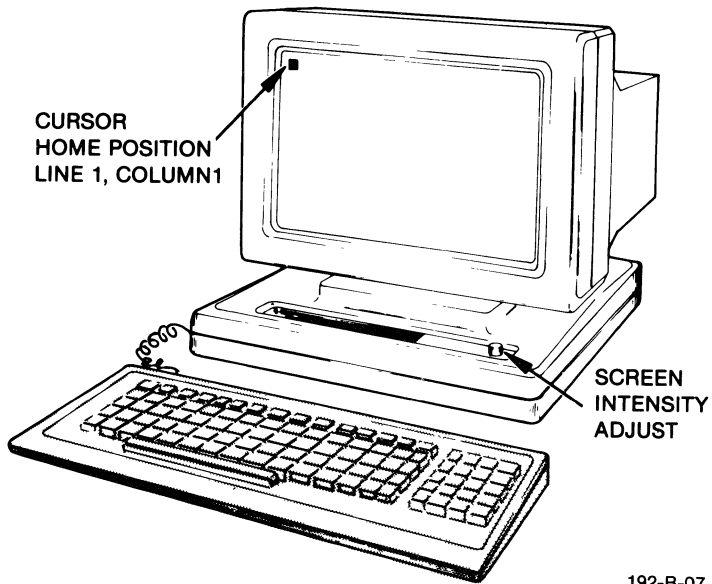
This section provides guidelines for the proper use of the QVT-103 video terminal including explanations of the terminal keyboard layout, general and special function keys, the numeric keypad, and general operator instructions. In addition, instructions for the proper configuration or Setup of the terminal are also provided.

POWERING ON THE TERMINAL

To power on the terminal perform the following steps:

1. Verify that the terminal is properly installed. Check to see that:
 - The Power Switch on the rear panel of the display module is in the OFF position;
 - The power cord is plugged into a grounded AC outlet;
 - The terminal rating and AC line voltage are compatible (see rating plate on the back cover);
 - The host computer cable is connected to the EIA Connector;
 - If a printer is to be used, it is connected to the AUX Connector;
 - The keyboard cable is connected to its connector on the left front corner of the display module.

2. Move the Power Switch to the ON position and observe that the following things occur:
 - The margin bell or beeper should sound once after about two seconds. If four beeps are sounded the default Setup configuration information stored in PROM was used instead of the Setup information stored in non-volatile RAM, see "Setup Organization" later in this section for a discussion of this situation.
 - In about ten seconds the cursor should appear at the Home position. Note: It may be necessary to adjust the screen intensity by rotating the knob on the right corner of the display module to make the display visible. Refer to Figure 3-1;
 - If an error code is displayed on the screen, refer to Appendix B for further details and contact your service representative;
 - If the terminal appears not to be operating, verify that the power source is satisfactory, and that the fuse installed on the rear panel is a good fuse. Contact your service representative.



192-B-07

Figure 3-1. The Screen Display After Powering On the Terminal

USING THE TERMINAL

Using a video display terminal is in many ways similar to using a typewriter, except that a video terminal has much greater capability. The ease by which data can be edited on the display screen, before it is printed or sent to the host computer is one of the most beneficial features.

From the operator's viewpoint, the keyboard is the most integral component because from it data is generated for entry into the host computer system. A good understanding of the keyboard is necessary to fully utilize and appreciate all of the terminal's capabilities.

Please continue to read the following sections to familiarize yourself with the general features of your terminal.

THE KEYBOARD

The QVT-103 video terminal uses a keyboard similar to those used on ordinary typewriters. But unlike a typewriter the terminal has additional keys for special functions that control cursor movement, generate control sequences, and provide terminal and computer status information. The keyboard is divided into three key groups:

standard or typewriter keys; Special function keys that include keyboard control, edit, print, setup, and programmable keys; and Numeric keypad keys. Each of these will be discussed in subsequent portions of this and other sections of this manual. Figure 3-2 shows the layout of the keyboard.

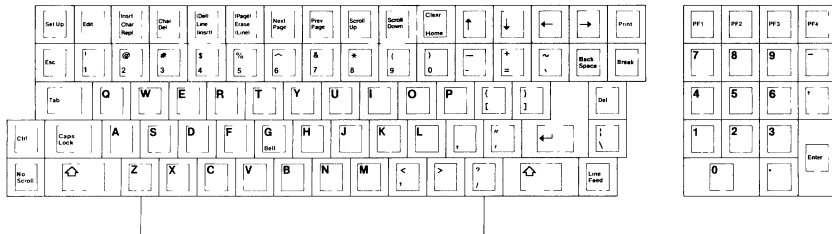


Figure 3-2. QVT-103 Keyboard

TYPEWRITER KEYS

The typewriter character keys (refer to Figure 3-3 in Foldout 3-1) function like those of an ordinary typewriter. When these keys are pressed they produce the codes necessary to generate the characters on the terminal display. Uppercase characters or special symbols are produced by using the Shift key or by enabling the Caps Lock key.

Backspace

This key generates the backspace control character (BS 08H). In Edit or Off- Line Modes, Backspace moves the cursor left one character position. The cursor stops at the left margin.

Caps Lock

This key is a toggle function. If it is activated (Caps Lock), the alphabetic keys generate uppercase characters; numeric keys are not affected. If the feature is not selected (the unlock condition), the alphabetic keys generate lower case characters. The CAPS indicator is displayed whether the Main Status line is displayed or suppressed.

OPERATION

Return

This key generates either a carriage return, or carriage return and line feed. The “CR feature” located in Set 1 of the Status Line determines which function the Return key will generate.

In Edit Mode, this key is also used to start character transmission to the computer when Line Transmit Mode is selected in Set 7 of the Status Line.

In half-duplex coded control (HDX B), Return can also automatically generate the line turnaround character. This auto turnaround is selected from Set 3 of the Status Line. In Edit Mode, the auto turnaround feature is always performed whether or not the option was selected in Setup.

Shift

When this key is used with the typewriter keys, uppercase characters are generated. This key is also used with Function, Printing, Editing, Break, Tab, and Setup keys.

Tab

This key generates the tab (TAB 09H) control character. Default tab settings are generated when the terminal is powered on. See “Operator Functions” below for a discussion of the Tab key usage including default settings. In addition, in Edit Mode when this key is used with the Shift key a backtab is generated.

SPECIAL FUNCTION KEYS

The special function keys (refer to Figure 3-4 in Foldout 3-1) are used to modify the operation of the keyboard. These keys provide flexibility in the use of the terminal; for example, they allow the operator to selectively configure the terminal according to application, edit the display, modify communication types, and activate print options. Special functions will be discussed below: the Setup key, however, will be discussed in detail in “Setup Mode and the Status Line” later in this section.

Keyboard Controls

Keyboard Control keys are used to modify the typewriter operations of the terminal and are dedicated to a specific function; for example, Delete, Backspace, Line Feed, and Home (which sends the cursor to the first column and row of the active display area). The keyboard control keys are described below:

Break. This key generates a 275 milli-second break when the break enable Setup feature is selected and the Break key is pressed alone (a long break 3.5 seconds used for disconnecting communication lines is generated when this key is used with the SHIFT key, see the COMMUNICATIONS Section for details). Break does not function when the terminal is in Edit Mode.

Delete. This key generates the delete (DEL 7FH) control character. In Edit Mode, Delete removes the character to the left of the cursor and moves all characters to the right of the deleted character to the left. Protected characters are not deleted.

Escape. This key generates the escape (ESC 1BH) control character. The Escape key is used to momentarily leave (escape) an application program in order to use a special feature or function. The Escape key is used with one or more of the typewriter character keys to specify a command sequence, and should be pressed and released before the second key is pressed. ESC does not function in Edit Mode. See the PROGRAMMER INFORMATION Section of this manual for more information.

Control. The Control key is similar in function to the Escape key because it is also used to activate a special feature or function. The Control key, however, must be used simultaneously with a typewriter character key to issue a command (similar in action to the Shift key). Refer to the PROGRAMMER INFORMATION Section and Appendix G for more information.

Linefeed. This key generates the linefeed control character (0AH).

Home. This key moves the cursor to the first line and first column of the scrolling region. The scrolling region is the area between the top and bottom margins. This key will always execute a home action but will also generate a clear screen when it is used with the Shift key while in Edit Mode.

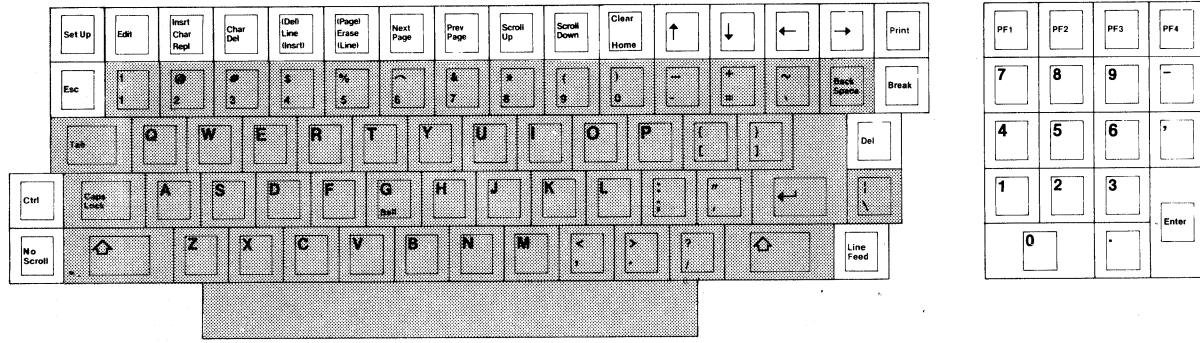


Figure 3-3. The Typewriter Character Keys

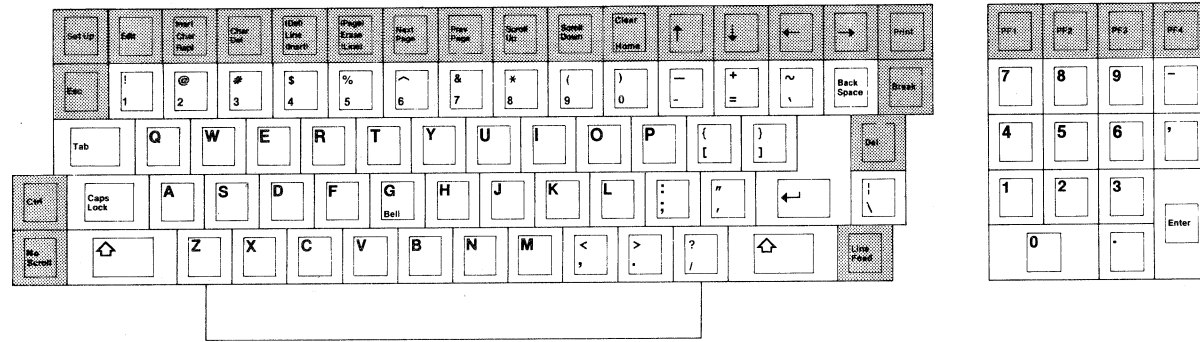


Figure 3-4. The Special Function Keys

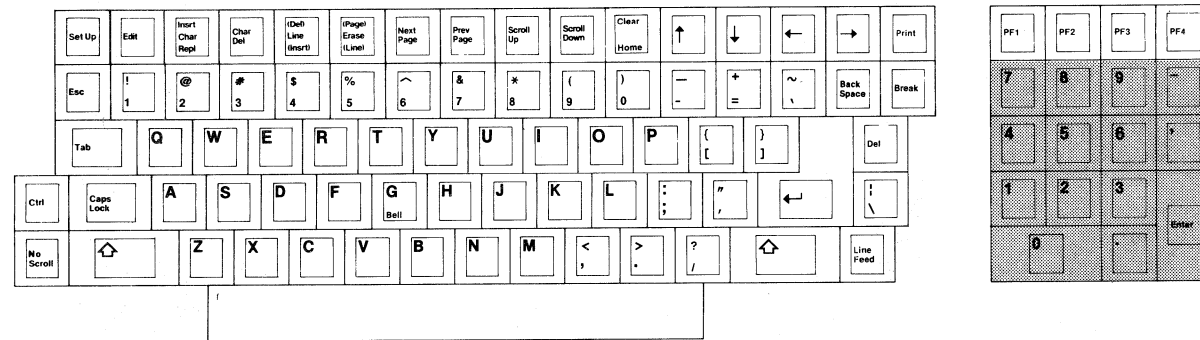


Figure 3-5. The Numeric Keypad

Editing Function Keys

The editing keys are generally located on the top row of the keyboard and are designed to simplify the editing process. The Editing function keys are described below.

Edit. This key can be used to toggle the system back and forth from Interactive Mode to Edit Mode. This option can also be selected in the Setup Mode or via an Escape control sequence. When the key is depressed the corresponding entry in the Status Line (last line on the screen) will be turned on or off accordingly whether the Status Line is displayed or suppressed.

In Edit Mode the terminal does not communicate with the computer after each keystroke. In addition, it configures the following edit keys for local operation: Character Insert/Replace, Character Delete, Line Delete/Insert, Erase Line/Page, Next Page, Previous Page, Home, and Clear. The use of these keys in this mode only affects screen data; nothing is transmitted to the host computer until the operator decides to transfer the information.

When in Interactive Mode, the terminal is On-Line and sends information to the computer as it is displayed on the screen. As a result, the editing keys are not operative.

Character Insert/Replace. This key, labelled Insrt Char Repl, switches or toggles between the Insert and Replace Modes. These modes determine how characters are added to the screen. This key only operates in Edit Mode.

This key only operates in Edit Mode.

In Character Insert Mode, characters are inserted at the current cursor position while previously displayed characters are moved to the right. Any characters that move beyond the current right margin setting or into another field are lost. The INSERT indicator in the Status Line is shown in bold intensity video when this key is used whether the Status Line is displayed or suppressed (note that this mode can also be activated from within Setup). Protected fields will not be lost.

In Replace Mode, the character at the current cursor position is replaced with the newly typed character. The INSERT indicator in the Status Line is shown in standard intensity video when the Replace Mode is active.

Character Delete. This function key, labelled Char Del, deletes the character at the cursor position and causes all succeeding characters on the line to be moved one position to the left. Character Delete only operates in Edit Mode (when the EDIT indicator in the Status Line is shown in bold intensity video) and does not delete protected characters.

Line Insert/Delete. This function key, labelled (Del) Line Insert, inserts and deletes lines when the terminal is in Edit Mode.

In Line Insert Mode (activated by pressing the function key only), a line of spaces will be inserted on the present cursor line. The cursor is moved to column 1 of the new line, and all subsequent lines are moved down one line. If there are no lines with protected fields below the current line position data on the last line will be lost as new lines are inserted. If there is a line somewhere below the current position that has a protected field then data on the last line above the protected line will be lost as new lines are inserted but all lines below the protected line are not affected when new lines are inserted. In all cases the line added will have the same character attributes as the line that was moved down. See "Character Sets" later in this section and "Other ANSI Compatible Sequences" in the PROGRAMMER INFORMATION Section. Line Insert has no effect if there is a protected field on the current line.

In Line Delete Mode (activated by pressing the SHIFT key and the function key) the line containing the cursor will be deleted. All remaining lines are moved up one line and the cursor is moved to column 1 of the present cursor line. The last line of the screen is filled with space characters. The line added to the screen will have the same character attributes as the last line moved up. This function has no effect if there is a protected field on the current line.

Erase Page/Line. This function key, labelled (Page) Erase Line, erases lines or pages from the display when the terminal is in Edit Mode.

In Erase Line Mode (activated by pressing the function key only) the entire line is erased except for protected fields. The character attributes do not change.

In Page Erase Mode (activated by pressing the Shift key and the function key) all lines on the entire page except for protected fields are erased and the cursor moves to the home position.

Note that erasing is different from deleting. Erasing changes all character values on the line to space characters while deletion removes all characters.

Next Page. This key causes the next page of the terminal's page storage to be displayed. If the last page is currently being displayed, pressing this key will not cause any action to be taken. For more information see the escape sequence for this function in the "Valid Mode Control Sequences" paragraph of the PROGRAMMER INFORMATION Section.

Previous Page. This key causes the previous page of the terminal's page storage to be displayed. If the first page is currently being displayed, pressing this key will not cause any action to be taken. For more information see the escape sequence for this function in the "Valid Mode Control Sequences" paragraph of the PROGRAMMER INFORMATION Section.

Scroll Up. This function key causes the screen to scroll up one line each time the key is pressed and only functions when the terminal is in Interactive Mode. The active cursor position is not changed when this function is performed. For more information see the escape sequence for this function in the "Valid Mode Control Sequences" paragraph of the PROGRAMMER INFORMATION Section.

Scroll Down. This function key causes the screen to scroll down one line each time the key is pressed and only functions when the terminal is in Interactive Mode. The active cursor position is not changed when this function is performed. For more information see the escape sequence for this function in the "Valid Mode Control Sequences" paragraph of the PROGRAMMER INFORMATION Section.

No Scroll. This function controls scrolling of the screen display. When NO SCROLL is first pressed, scrolling stops which means that new characters cannot be displayed. When the key is pressed again scrolling resumes and additional characters are displayed. This feature only functions when the terminal is in Full-Duplex Mode and the Auto XON/XOFF feature is turned on (see Sets 5 and 6 of the Status Line).

Print Function

This key prints the contents of the screen. It functions whether the terminal is On-Line or Off-Line and whether it is in Interactive or Editing Mode.

Print performs full or partial page prints depending upon which option was selected from Set 4 of the Status Line. When SCREEN is selected all characters on the screen are printed. When SCROLL is selected only the characters located in the scrolling region are printed (see Set 4 of the Status Line later in this section for details). If the entire screen is in the scrolling region then the entire page will be printed.

Also note that protected characters will not be printed if the Protect Transfer option is on (see Set 7 of the Status Line for details).

The Auto-Print Mode is turned on and off by holding down the Control key and pressing the Print key (see "Valid Command Sequences" in the PROGRAMMER INFORMATION Section). This mode only functions in Interactive Mode and will print a line at a time when a vertical tab, form feed, linefeed, or auto wrap is performed.

Programmable Function Keys

The QVT-103 video terminal has twelve programmable functions that allow storage of strings of commands in memory which can be executed by simply pressing one or two keys. The four PF keys located on the auxiliary keypad can be used alone or with the Shift or Control keys to generate the 12 functions. Instructions for programming the function keys are contained in the PROGRAMMER INFORMATION Section of this manual.

NUMERIC PAD

The Numeric Keypad (refer to Figure 3-5 in Foldout 3-1) allows numbers to be entered in calculator fashion. Each number key of the numeric keypad generates the same characters as the number keys in the typewriter character set. Depressing the Enter key of the numeric keypad generates a Carriage Return. The numeric keypad also functions in Auxiliary Keypad Mode which allows rapid entry of a limited set of special commands and function characters instead of the numeric and function characters that appear on the keys. See "Keypad Character Selection" in the PROGRAMMER INFORMATION Section of this manual.

SETUP MODE AND THE STATUS LINE

THE STATUS LINE AT A GLANCE

The Status Line is the last line (25th line) on the display screen. It provides a simple, easy to use means of viewing and modifying terminal configuration, communication and user status information.

After power-up and at all times that the terminal is not in the Setup Mode, the 25th line can be used to display terminal status information. The status information on the 25th line can be suppressed by the host computer or from Set 2 of the Status Line. Thus the status can be displayed continuously or on an as-needed basis. The Status Line actually consists of eleven lines that contain a series of fields, whose contents may be selectively set from the keyboard. Many of the fields can also be altered from the host computer. The first line is the Main Status Line, the second line is the Tab line, and the next nine lines are Status Lines labelled Set 1 through Set 9. The Status Lines are most commonly viewed and altered via the keyboard through the Setup function (many can also be set using valid escape control sequences, see the PROGRAMMER INFORMATION Section for details). Later in this section the Setup function will be discussed in detail including how to enter the Setup Mode, and how to modify the current values in the Main Status Line, Tab Line or other lines.

SETUP ORGANIZATION

Setup features are stored in three different memory locations: operating features (volatile RAM), user features (non-volatile or static RAM) and default features (PROM). The terminal always operates according to the Setup operating features contained in RAM memory. This memory is either set directly from keyboard input by the user, from user features stored in non-volatile RAM or from the default features stored in PROM. When the terminal is powered-on the Setup values contained in the non-volatile RAM user features are loaded into the operating features RAM memory and are immediately in effect. The terminal beeps once to acknowledge that the features were correctly loaded. If the terminal beeps four times at power-on the information read from non-volatile RAM may be invalid. In this case the default values from the PROM will be used. The user features which were contained in the non-volatile RAM must again be stored (see Storing User Selected Features discussed below). To minimize the inconvenience associated with the loss of user features contained in the non-volatile RAM, it is suggested that the terminal configuration information that is used for a given system be noted on the summary chart of Setup lines located at the end of Appendix H. Figure 3-6 illustrates the organization of Setup memory. Also see "Default Features" in the next paragraph for more information.

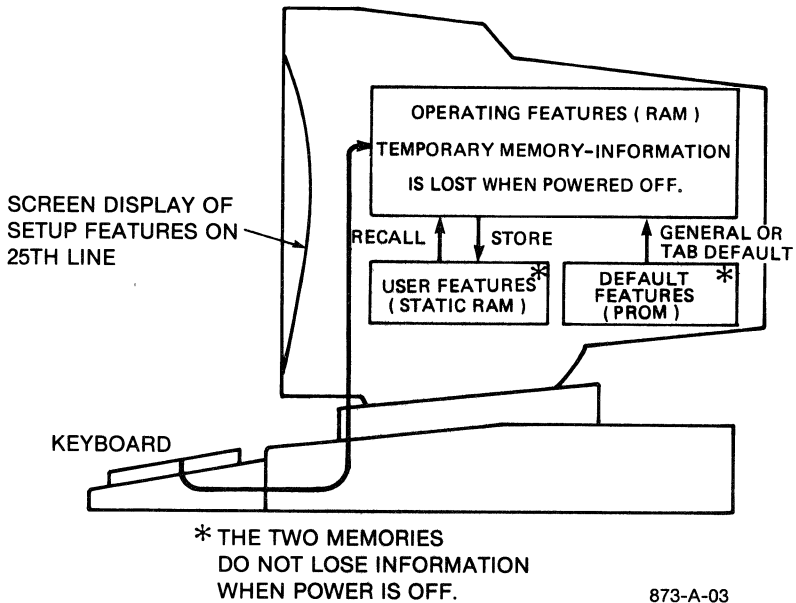


Figure 3-6. Setup Memory Organization

HOW TO ENTER AND MODIFY THE STATUS LINE WITH SETUP

The Setup Mode is entered and the Status Line displayed by pressing the Shift key, the Control key, and then the Setup key (do not release any key until all 3 are pressed). The contents of the screen will not change but the cursor will move to the 25th line. At this point only those keys specified to operate in this mode will operate. There are two types of movement in the Setup Mode: horizontal to select an option in a given Set of the Status Line or vertical to move from one line to another. Horizontal positioning is made via the left and right cursor (arrow) keys. It should be noted that the cursor will only enter an option field which can be changed. Vertical positioning is made via the up and down cursor keys. Once in the desired field the space bar must be used to select the appropriate option. The first field accessed upon entering Setup Mode is the Main Status Line. If you press the down cursor key once the TAB line is accessed. (see "Tab Control" later in this section). If you press the down cursor key again you will enter Set 1 of the Status Line and so on through Set 9. Successive use of the up and down keys can be made to move from one Status Line to another.

HOW TO SAVE AND RECALL SETUP FEATURES

Once the desired Setup option has been reached and selected (see “Definition of Status Line and Setup Features” later in this section for a detailed description of all the Setup options and their meaning) the current terminal configuration can be modified either temporarily or permanently. There are four possible ways that this can occur:

Current Operating Features

Once the options have been changed press the Setup key and the changes will take effect immediately. Note that changes made in this manner will only last the duration of this session on the terminal. If the terminal is turned off, or a recall, default, or reset is made the previous user selected features will again take effect. See figure 3-6 for more information.

Storing User Selected Features

To place the changes into non-volatile RAM memory which will replace operating features that are stored in volatile RAM during a recall, reset or power-up execute the following:

1. Enter the Setup Mode;
2. Make the desired changes;
3. Hold down the Shift key and press the “S” key;
4. The display will blink to acknowledge that the changes have been made; and
5. Press the Setup key to exit the Setup Mode.

See figure 3-6 for more information.

Recalling User Selected Features

To place the non-volatile RAM selection of options into the operating feature memory thereby overwriting temporary changes execute the following:

1. Enter the Setup Mode;
2. Hold down the Shift key and press the “R” key;
3. The display will blink to acknowledge that the recall has occurred; the screen will be cleared, and
4. Press the Setup key to exit the Setup Mode.

See figure 3-6 for more information.

OPERATION

Resetting the Terminal

To perform a power-up test (see the PROGRAMMER INFORMATION Section for a discussion of the power-up test) and recall the user selected features into the operating feature memory execute the following:

1. Enter the Setup Mode;
2. Press the 0 (zero) key.

The following events will occur:

1. The terminal disconnects from the communication input buffer;
2. Input and keyboard character buffers are erased;
3. Power-up self-test is performed;
4. A recall of user selected features occurs;
5. The terminal exits Setup Mode; and
6. Characters displayed on the screen before entering Setup are lost and the screen is cleared.

See figure 3-6 for more information.

Default Features

The default features that are originally defined for the terminal (in the PROM) can be loaded into the operating memory. Execute the following:

1. Enter the Setup Mode;
2. Hold down the Shift key and press the "D" key.

The following events will occur:

- A. The terminal disconnects from the communication input buffer;
 - B. Input and keyboard character buffers are erased;
 - C. The tab line is displayed; and
 - D. Default features are selected and the screen is cleared.
3. Press the Setup key to exit the Setup Mode.

See figure 3-6 for more information.

DEFINITION OF STATUS LINE AND SETUP FEATURES

This paragraph defines all the Status Line and Setup Mode features of the QVT-103 video terminal. The features will be presented in the order in which they appear in the Main Status Line and the nine Setup Lines. Default values for features in Status Line diagrams are shown on the first line of the diagrams. In addition to selection via the Status Lines, some selections may be made from the host computer or from the terminal via command codes, these selections are identified by an asterisk (*) in the descriptions which follow.

THE MAIN STATUS LINE

	OFF-LINE	COL 1	PAGE 1	EDIT	INSERT	KYBD ON	MNTR	ON/OFF L1 L2 L3 L4
CAPS	ON-LINE	COL nnn	PAGE n	EDIT	INSERT	KYBD LOCK	MNTR	ON/OFF L1 L2 L3 L4

CAPS/(blank)

CAPS LOCK. Caps (capitals) is selected by depressing the CAPS LOCK key. This causes all alphabetic keystrokes to be displayed and printed in uppercase. When the Caps Lock key is not set this field is blank. Since this key is a toggle, the feature can be turned off by pressing the key a second time. In addition, the default value for the feature is blank (lowercase) and the feature cannot be saved using the Setup save features. The cursor cannot enter this field when Setup Mode is entered. If capitals is selected, the CAPS indicator will be displayed whether the Main Status Line is displayed or suppressed. If the Status Line is suppressed the indicator will display in the same video type as would be displayed when the Status Line is displayed.

OFF-LINE/ON-LINE

On-Line/Off-Line mode. When the terminal is connected to the computer and can receive and transmit data it is ON-LINE. When the terminal is not connected to the computer it is OFF-LINE. In this case data will appear on the display but no communication between computer and terminal can occur.

OPERATION

COL

Column.* This field displays the current position of the cursor on the screen (if in Setup Mode the value is the current position on the screen before entering Setup). When using 80 column Mode, the field will display 1 through 80 inclusive. While in 132 column Mode, the field will display 1 through 132 inclusive.

PAGE

Page.* This field indicates the current screen memory page number. In 80 Column Mode, 2 pages are standard with a hardware upgrade option to add a third and fourth page. In 132 column Mode one page is standard with a hardware upgrade option to add a second page.

EDIT

Edit Mode.* This field indicates whether the terminal is in Edit or Interactive Mode. When the option is not selected (standard intensity video) and the Status Line is displayed, the terminal is in Interactive Mode (assuming that the On-Line feature is also on). This means that keystrokes are sent to the computer as they are entered. When Edit Mode is on (bold intensity video), the terminal will display characters on the screen but will not transmit the characters until either the computer or operator make a request. When the transmission occurs it will be as a block of data. When in Edit Mode the EDIT indicator will be displayed whether the Main Status Line is displayed or suppressed. If the Status Line is suppressed the indicator will display in the same video type as would be displayed when the Status Line is displayed.

Note that Scroll Up and Scroll Down do not function in Edit Mode.

INSERT

Insert Mode.* When the terminal is in the Insert Mode the field will be in bold intensity video. Insert Mode is only active when the terminal is in Edit Mode. Insert Mode causes any typed characters to be inserted at the current cursor position, moving previously displayed characters to the right. Insert Mode does not move characters to the next line, they are lost if they move beyond the current right margin position. This feature is off when the field is displayed in standard intensity video. When in Insert Mode, the INSERT indicator will be displayed whether the Main Status Line is displayed or suppressed. If the Status Line is suppressed the indicator will display in the same video type as would be displayed when the Status Line is displayed. If Edit Mode is turned off and the INSERT indicator is displayed, the indicator can not be turned off from the Insert key until Edit Mode is again activated.

**KYBD ON/
KYBD LOCK**

Keyboard On/Keyboard Locked.* If the keyboard is ON, then it can be used as a data entry device. If the keyboard is LOCKED then it cannot be used to enter any data. It is still possible to unlock the keyboard if it locks, simply enter and exit the Setup Mode, this will put the keyboard into "ON" Mode. Note that the computer can still communicate with the terminal, it is only the keyboard that is affected.

If the Keyboard locks and the Status Line is suppressed the KEYBOARD LOCKED indicator will be displayed in bold intensity video on the 25th line.

MNTR

Monitor Mode. In Monitor Mode (field displayed in bold intensity video) all commands (control characters and escape sequences) are displayed but are not executed. When the feature is not selected (standard intensity video) the normal method of executing but not displaying commands is activated. This field cannot be saved.

OPERATION

ON/OFF L1-L4

Indicators.* This field is used in VT100 and QVT-103 modes. These fields function as lamp indicators that can be used as warning lights or other user defined needs. The indicators are controlled independently from the keyboard or from the host computer by using the proper escape sequences (see Programmable Keys in the PROGRAMMER INFORMATION section). If indicators L1-L4 are used when the Status Line is displayed then one or more of the indicator fields are shown in bold intensity video to indicate that it is on. Any of the fields that are off when the Status Line is displayed will be displayed in standard intensity video. This field cannot be entered while in Setup Mode and cannot be saved using any of the Setup options. When on, the indicator fields will be displayed whether the Main Status Line is displayed or suppressed. If the Status Line is suppressed the indicators will display in the same video type as would be displayed when the Status Line is displayed.

TAB LINE

The Tab line within the Setup Mode is designed to allow easy modification of tab settings for the terminal. Tab default settings, modifications, and general usage are discussed in detail in "Operator Functions" later in this section.

SET 1 OF THE STATUS LINE

SET 1	EIA RS232	CUR BB	80 COL	EM:QVT 103	CR ONLY	SCROLL SM	60 HZ	MAN PAGE
	EIA C. L.	CUR xx	132 COL	EM: xx	CR + LF	SCROLL JP	50 HZ	AUTO PAGE

EIA RS232/C.L.

EIA RS232/Current Loop. This feature selects the host port (labelled EIA on the rear panel) Communications Mode; either RS232-C or 20ma current loop.

CUR	<p>Cursor. This feature selects the type of cursor to be used by the terminal. The choices are:</p> <ul style="list-style-type: none">BB — block and blinkingUB — underline and blinkingUS — underline and steadyBS — block and steadyNO — no cursor (invisible)
COL	<p>Columns.* This feature selects a display of 80 or 132 columns. When this field is changed the screen is cleared.</p>
EM	<p>Emulation.* This feature selects the command set that will be used by the terminal. Note that non-QVT-103 Modes are emulations. The following options are available:</p> <p>QVT-103 -this is native Qume QVT-103 Mode. VT131 -selects the Digital VT131 command set VT100 -selects the Digital VT100 command set VT52 - selects the Digital VT52 command set</p>
CR ONLY/+LF	<p>Carriage Return/Carriage Return and Linefeed.* This feature selects the characters transmitted when a carriage return character (denoted as CR or Return) is generated. In addition, the feature determines how the terminal will process a linefeed character (LF).</p> <p>When “CR Only” is selected , the Return key generates a carriage return. When the terminal receives a linefeed (LF) the cursor moves down to the next line but maintains its current column position.</p> <p>When “CR + LF” is selected, the Return key generates a carriage return (CR) and a line feed (LF). When the terminal receives a linefeed (LF), the cursor moves to the left margin of the next line.</p>

OPERATION

CR ONLY/+LF
(cont)

Since form feed (FF) and vertical tab (VT) are processed as linefeed (LF), this feature affects the execution of these commands as well.

SCROLL SM/JP

Scroll Mode.* There are two types of scrolling: smooth (SM) and jump (JP). Jump scrolling causes the terminal to display characters on the screen as fast as they are received from the computer. This mode must be used if the auto XON/XOFF is not activated (see Setup Line 5).

Smooth scrolling causes the terminal to display characters at a steady rate of five lines per second at 60 Hz and four lines per second at 50 Hz. If this mode is used then auto XON/OFF must be used to prevent loss of data as it is received from the computer.

50/60 Hz

Refresh rate. This feature must be set to match the power line frequency to minimize screen flicker.

MAN/AUTO PAGE

Manual Page/Auto Page Modes.* This field selects the Auto-Page or Manual Page Mode and is applicable only when the terminal is in Interactive Mode. In Auto-Page Mode all available lines (48 or 96 in 80 column mode or 24 or 48 in 132 column mode) become page 1 as the default setting. Scroll down works until top of page is reached and scroll up works until bottom of page is reached. The scrolling rows are not erased when scroll up and scroll down are used.

In Manual Page Mode one page is 24 lines and the scrolling rows are erased if scroll up, scroll down, LF, VT, or FF are used at the top or bottom of the page. When the terminal is in Edit Mode the Auto/Man Page Mode is overridden.

When switching from Manual Page Mode to Auto Page Mode the cursor will move to the top of the single page available in Auto Page Mode, therefore the current portion of the page displayed before changing modes may not be displayed after the switch (i.e. if on page 2, 3, or 4 of the manual mode when switching modes, the display will change to page 1). Likewise, when switching from Auto Page Mode to Manual Page Mode page one, line one will be displayed; therefore, the current portion of the page displayed before changing modes may not be displayed after changing modes. In either case, the display will always be the top of the first page and no data is lost when switching modes.

Since there is only one page in Auto Page Mode, Next Page and Previous Page do not function.

SET 2 OF THE STATUS LINE

SET2	ON/OFF	KEYRPT	BELL	KEYCLK	SCREEN SAVER	STATUS	LINWRAP	WPS
------	--------	--------	------	--------	--------------	--------	---------	-----

ON/OFF

All features in this line are **ON** when in bold intensity video and are **OFF** when in standard intensity video.

KEYRPT

Key Repeat.* This feature determines if keys will automatically repeat transmission when pressed for more than one half second. Keys will auto-repeat at approximately 30 characters per second. When key repeat is **OFF** keys do not repeat unless the key is repeatedly released and depressed. The default condition for this feature is **ON**. All keyboard keys will auto-repeat except the following: Setup, Esc, Return, (Insert) Char Repl, (Del) Line Insert, (Page) Erase Line, Caps Lock, No Scroll, and Edit.

OPERATION

BELL

Bell. This feature generates a bell tone when the cursor moves past the eighth character position from the end of the line. The volume of the bell tone is not adjustable. The default condition for this feature is OFF.

KEYCLK

Keyclick. This feature generates a keyclick sound each time a key is pressed (Shift, Caps Lock, and Ctrl do not generate keyclicks). Keyclick volume is not adjustable. Default for this feature is ON.

There are two circumstances when keyclicks are not generated even though the feature is selected:

1. If the keyboard is in a locked condition. This condition is indicated in the Status Line.
2. If the CTRL key is pressed with any of the following keys:

- | | |
|---------|------------|
| 1. !/1 | 9. (/9 |
| 2. @/2 | 10.)/0 |
| 3. #/3 | 11. _/- |
| 4. \$/4 | 12. +/= |
| 5. %/5 | 13. Delete |
| 6. ¢/6 | 14. ./; |
| 7. &/7 | 15. </, |
| 8. */8 | 16. >/. |

SCREEN SAVER

Screen Saver. This feature allows the screen to turn off without loss of data if the terminal has been inactive for more than 15 minutes thereby prolonging the life of the terminal screen. This feature causes the terminal to redisplay the contents of the screen when it receives a transmission from the computer or from the keyboard.

STATUS

Status.* This feature determines if the Status Line is displayed or suppressed and also selects the manner in which the Status Line and Setup lines will be displayed. This is the only On/Off feature that allows four display alternatives. This description is only true if the screen is displayed in normal video. If the screen is displayed in reverse video then substitute normal for reverse and vice versa.

Note that the two suppressed Status Line types described below are also valid for fields displayed independently of the Status Line display option.

Reverse Video - This selection turns the Status Line off when Setup Mode is exited. If the Status Line is turned on from the computer or from a valid escape sequence and this feature has been selected, the Status Line will display in the opposite type of video display as is used for the screen display (i.e., if the screen is displayed as light characters on a dark background or normal video, then the Status Line would be displayed as dark characters on a light background).

Bold Reverse Video - This selection turns on the Status Line. The Status Line is displayed in the opposite type of video display as is used for the screen display (i.e., if the screen is displayed as light characters on a dark background or normal video, then the Status Line would be displayed as dark characters on a light background).

Normal Video - This selection turns off the Status Line when Setup Mode is exited. If the Status Line is turned on from the computer or from a valid escape sequence and this feature has been selected, the Status Line will display in the same type of video display as is used for the screen display (i.e.,

OPERATION

STATUS (cont)

if the screen is displayed as light characters on a dark background or normal video, then the Status Line would be displayed as light characters on a dark background).

Bold Normal Video - This selection turns on the Status Line. The Status Line is displayed in the same type of video display as is used for the screen display (i.e., if the screen is displayed as light characters on a dark background or normal video, then the Status Line would be displayed as light characters on a dark background or vice versa).

The default condition is Status Line OFF and normal video.

LINEWRAP

Line-wraparound.* This feature selects where the next character is displayed on the screen when the cursor is at the right margin. When the feature is ON the next character is displayed at the left margin of the next line. When the feature is OFF all subsequent characters are displayed at the current right margin of the current line. The default condition is OFF.

This feature does not transmit the carriage return or line feed characters to the computer.

WPS

Word-processing. This feature selects the position of the Line Feed and Backslash keys on the keyboard. The keys switch function when the terminal is used as a word processing terminal with some Digital Equipment software. In other applications the feature is not needed, hence the default condition is OFF.

SET 3 OF THE STATUS LINE

SET 3	ON/OFF	BREAK	AUTO TURN	AUTO ANSBK	ANSWBK MSG
-------	--------	-------	-----------	------------	------------

ON/OFF All features in this line except ANSBK MSG are ON when in bold intensity video and are OFF when in standard intensity video.

BREAK Break. This feature determines if the terminal transmits a 250 ms (milli-second) break signal when the Break key is pressed. If the feature is OFF, Break does not function when pressed alone. All other key sequences that use Break are not affected. The default condition for this feature is ON.

AUTO TURN Automatic Line Turnaround. This feature is the automatic turnaround capability which automatically generates a line turnaround character during data transmission to signal a reversal of transmission direction. The feature is only used when the modem control feature (see the first entry in Set 6 of the Status Line) is set to half-duplex coded control (HDX B). The specific character used to signal line turnaround is selected in the End-of-Block feature in Set 6 of the Status Line. In Edit Mode, the auto turnaround is used whether this feature is selected or not. The turnaround character is automatically transmitted after:

1. The characters transmitted by the Return key;
2. The end of an answerback message.

Note: if the selected turnaround character is a carriage return (CR) the first case above does not generate two carriage returns.

When the auto turnaround feature is OFF, the turnaround character must be generated by using a control key combination.

OPERATION

AUTO ANSBK

Automatic Answerback. The automatic answer-back feature determines whether the terminal automatically transmits the answer-back message to identify itself when a communication line connection is made. In half-duplex communication with the initial state of the terminal in receive mode, the answer-back message cannot be transmitted until the terminal goes into transmission mode. In addition, auto answer-back does not affect answer-back message transmission when the Control key and Break key sequence is used. The default condition for this feature is OFF.

ANSWBK MSG

Answerback Message Field.* This feature provides the terminal with a 20 character identifying message that can be transmitted to the computer. The answer-back message is transmitted when:

1. The terminal receives a direct request for identification from the computer. The computer transmits an enquire (ENQ) and the terminal automatically responds with the answer-back message. This sequence of events does not affect the screen or require operator action.
2. A terminal user manually transmits the answer-back message from the keyboard by simultaneously pressing the Control (CTRL) and Break keys.
3. The auto answer-back feature is selected and the terminal connects to the communication line. In half-duplex, the answer-back is transmitted when the terminal goes into transmit mode.

An explanation of how to create an answer-back message is provided as follows:

1. Enter the Setup Mode;
2. Use the down arrow cursor control key to select Set 3.
3. Use the right cursor control key to select the answer-back field.
4. Type a message delimiter which is any character that will not be used in the answer-back message. This delimiter will not be transmitted as part of the answer-back message.
5. Type the answer-back message. This can be a maximum of 20 characters. If a control character is used, it will be displayed as its control character symbol. Be certain to end the answer-back message with the same delimiter character that was used at the beginning of the message.

If a mistake is made while typing the answer-back message use the Back-space character to delete the unwanted character(s).

To save the answerback message it is necessary to exit the Answerback field and then issue a Shift S while in Setup to place the message in the static RAM.

In addition to entering the answer-back message, the programmable function keys can also be programmed from the answer-back field. See "How to Program the Function Keys" in the PRO-GRAMMER INFORMATION Section.

SET 4 OF THE STATUS LINE

SET 4	NORM VID	AUX PORT	SPEED 300	WORD/PAR 7S	TERM CHAR FF	PRINT SCROLL REG
	REVR VID		SPEED nnnn	WORD/PAR xx	TERM CHAR NO	PRINT SCREEN

NORM/REVR VID Normal/Reverse Video.* This feature selects screen background. In normal video the display has light characters on a dark background. In reverse video the display has dark characters on a light background. The default selection is normal video.

AUX PORT Auxiliary Port. This field pertains to the rest of the entries of Set 4 and cannot be entered. The other four fields pertain to the operation of the auxiliary port (printer port).

SPEED Speed. This feature selects the transmit/receive speed (baud rate) for printer communications. The following speeds are available: 50, 75, 110, 134.5, 150, 200, 300, 600, 1200, 1800, 2000, 2400, 3600, 4800, 9600, and 19200. The printer interface uses one stop bit per character for all speed selections greater than 110 and two stop bits per character for all selections of 110 or less. The default selection is 300 baud.

WORD/PAR Word/Parity type. This feature selects the number of data bits per character and the type of parity. The following choices are available:

Selection	Meaning
7S	7 data bits, space parity
7M	7 data bits, mark parity
7O	7 data bits, odd parity
7E	7 data bits, even parity
7N	7 data bits, no parity
8O	8 data bits, odd parity
8E	8 data bits, even parity
8N	8 data bits, no parity

The default selection is 7S.

TERM CHAR FF/NO Termination Character type.* This feature determines whether a termination character is sent to the printer at the end of a transmission. The only valid termination character is a Form Feed (FF) which is transmitted to the printer after a print screen operation. The terminal always transmits carriage return (CR) and line feed (LF) characters when printing is complete whether the termination character is selected or not. The default selection is the transmission of FF.

PRINT SCROLL REG/SCREEN Print Region.* This feature selects the region of the screen that is printed when a print screen operation is executed. When screen (SCREEN) is selected, all characters on the full screen are printed. When scroll region (SCROLL REG) is selected, only those characters in the scrolling region are printed. The scrolling region is the area between the top and bottom margins. If no margins are set, all characters on the screen are printed. The default selection is SCROLL REG.

SET 5 OF THE STATUS LINE

SET 5	EIA PORT	AUTO XON/XOFF	WORD/PAR 7S	PAR CHECK	STOP 1	XMIT 9600	RCV 9600
	EIA PORT	NO XON/XOFF	WORD/PAR nn	PAR IGNORE	STOP 2	XMIT nn	RCV nnnn

Sets 5 through 9 of the Status Line contain fields for communication parameters for the main port (labelled EIA PORT in the first field of the Set 5).

AUTO/NO XON/XOFF Automatic/No XON/XOFF characters. This feature selects the handshaking protocol for transmitted and received data through the main port. If this feature is turned off, (NO XON/XOFF), the terminal ignores the protocol sent to it through the main port. The printer interface uses XON/XOFF whether or not this feature is selected. The default selection is Auto XON/XOFF. When OFF the NO SCROLL key which uses XON/XOFF does not function.

OPERATION

WORD/PAR

Word/parity type. This feature selects the number of data bits per character and the type of parity. The following choices are available:

Selection	Meaning
7S	7 data bits, space parity
7M	7 data bits, mark parity
7O	7 data bits, odd parity
7E	7 data bits, even parity
7N	7 data bits, no parity
8O	8 data bits, odd parity
8E	8 data bits, even parity
8N	8 data bits, no parity

Note: when 8-bit characters are selected, the eighth data bit is set to space (0) for transmitted data and ignored for received data.

The default selection is 7S.

PARITY CHECK/ IGNORE

This feature determines whether the terminal checks or ignores the parity bit of received characters. If this feature is set to CHECK, the terminal checks the received character's parity bits according to the parity feature. The terminal can check for odd or even parity. The terminal does not check for mark or space parity. If a parity error occurs the terminal will display the substitution character (SUB 1AH) in place of the character with the error. When this feature is set to IGNORE, the terminal ignores any parity bit received. The default selection is CHECK.

STOP

Stop Bits. This feature selects the number of stop bits used by the main port. Either one or two bits can be selected. This feature does not determine the number of stop bits used by the printer interface, the Setup feature for printer transmit/receive speed (see Set 4 of the Status Line) makes this selection. The default selection is one stop bit.

XMIT SPEED Transmit Speed. This feature selects the speed (baud rate) of characters transmitted through the main port. The following speeds are available: 50, 75, 110, 134.5, 150, 200, 300, 600, 1200, 1800, 2000, 2400, 3600, 4800, 9600, and 19200. The default selection is 9600 baud.

RCV SPEED Receive Speed. This feature selects the speed (baud rate) of characters received through the main port. The following speeds are available: 50, 75, 110, 134.5, 150, 200, 300, 600, 1200, 1800, 2000, 2400, 3600, 4800, 9600, and 19200. The default selection is 9600 baud.

SET 6 OF THE STATUS LINE

SET 6	FDXA	NO ECHO	INIT XMIT	EOB/DC ETX/EOT	DISC: CHAR OFF DLY NORM
	nnnn	LOC ECHO	INIT RVC	EOB/DC nnn/nnn	DISC: CHAR nnn DLY nnn

FDXA This feature selects various types of Half- and Full-duplex Communications Modes for the main port. See the COMMUNICATIONS Section for a detailed explanation of Communication Modes and Implementation. The following selections are available:

FDX A Full-duplex, without EIA modem control

FDX B Full-duplex, with EIA modem control

FDX C Asymmetric Full-duplex with EIA modem control

HDX A Half-duplex Supervisory Mode

HDX B Half-duplex Coded Control

A brief explanation of each of these modes is provided below:

Full-duplex without EIA modem control (FDX A) allows the terminal to communicate

OPERATION

FDXA (cont)

with the computer regardless of the received modem control signals.

Full-duplex with EIA modem control (FDX B) allows the terminal to communicate with the computer only when the correct modem control signals are present. The modem control signals are used to assure proper connection before and during transmission.

Asymmetric Full-duplex with EIA modem control (FDX C) allows full-duplex communication using a half-duplex modem with a secondary channel. The terminal transmits on the secondary channel (typically 75 to 110 baud) and receives data on the primary channel (typically 1200 to 2400 baud).

Half-Duplex in Supervisory Mode (HDX A) allows the computer to control line turnarounds using secondary channel control signals.

Half-Duplex Coded Control (HDX B) allows the transmitting device to control line turnarounds with control characters. The transmitting device controls line turnarounds by transmitting a turnaround character specified by the defined turnaround/disconnect character (see Set Status Line 6 entry below).

NO ECHO/ LOCAL ECHO

No Echo/Local Echo.* In Local Echo Mode every character transmitted to the computer is also displayed on the screen. In No Echo Mode the characters are sent to the computer. In this latter mode the display of characters on the screen is computer-dependent. The default selection is No Echo.

INIT XMIT/RCV

Initial Transmit/Receive. This feature is used only when the modem control feature is set to half-duplex (HDX A or HDX B). The

feature determines if the terminal begins half-duplex communication by transmitting (XMIT) or receiving (RCV).

EOB/DC

End of Block/Disconnect Character.* This feature selects the following:

1. The turnaround character used with the half-duplex coded control (HDX B) modem feature. When in this mode a turnaround character must be selected.
2. The end-of-block character used with all other modem control selections when the terminal is in Edit Mode.
3. The disconnect character used in all half-duplex or full-duplex modem control feature selections.

The turnaround/disconnect character pair selections are listed below:

End of Block Character	Disconnect Character
Form Feed (FF)	End of Transmission (EOT)
End of Text (ETX)	End of Transmission (EOT)
End of Transmission (EOT)	Data Line Escape (DLE EOT)
Carriage Return (CR)	End of Transmission (EOT)
Device Control 3 (DC3)	End of Transmission (EOT)
-----	End of Transmission (EOT)

DISC: CHAR DLY

DISCONNECT
CHARACTER

Disconnect Character. This feature determines if the terminal disconnects from the communication line when it receives a disconnect character. When enabled the terminal also transmits a disconnect character whenever a long Break (Shift Break) interrupt is generated. When the feature is disabled communication line disconnects do not occur when control characters are received. The default selection is OFF.

OPERATION

DISCONNECTION DELAY

Disconnection Delay. This feature is used only when the modem control feature is set to Full-duplex with modem control (FDX B or FDX C). In these modes the terminal disconnects from the communication line after the Data Carrier Detect (DCD) signal turns off. This feature selects the time period between loss of signal and disconnection. The choices are normal and UK delay.

Note: In the United Kingdom, the telephone system transmits a dial tone 0.06 seconds after DCD is lost. For most other installations, the dial tone is transmitted after 2 seconds.

SET 7 OF THE STATUS LINE

SET 7	XFER ALL	XMIT PAGE	XMIT TERM FP	XMIT EXC IMMED	ERASE ALL
	XFER UNPRCT	XMIT LINE	XMIT TERM PP	XMIT EXC DEFR	ERASE UNPRCT

XFER ALL/ UNPRCT

Transfer All/Transfer Unprotected.* This feature determines if the terminal will transmit protected screen characters to the computer or printer. When ALL is selected all characters on the screen are transmitted. When UNPRCT is selected, protected characters, as determined by the PROTECTION feature in the Set 8 Status Line, are not transmitted.

XMIT PAGE/LINE

Transmit Page/Line.* This feature determines the size of the block of characters that are transmitted to the computer in the Edit Mode. When LINE is selected, one line of characters is transmitted each time Return or Enter is pressed. When PAGE is selected, the transmit termination feature (see the next Status Line entry below) determines the block size that is transmitted. The default selection is PAGE.

XMIT TERM FP/PP	<p>Transmit Full Page/Partial Page. When Transmit Page (see above) is selected, this feature determines if the transmitted block is a full page (FP) or a partial page (PP). When full page is selected, all the characters within the top and bottom margins are transmitted. When partial page is selected, the characters between a partial page marker and the cursor are transmitted (partial page markers are set through execution, they are not user selectable). If a partial page marker is not present, the top margin is used. The marker (which is not displayed) is automatically positioned at the last character transmitted. The default selection is Full Page (FP).</p>
XMIT EXEC IMMED/DEFR	<p>Transmit Execution Immediate/Deferred.* This feature determines how the Enter key functions. When Deferred (DEFR) Mode is selected, the terminal transmits a Set Transmit State (ESC S) to the host computer to request permission to transfer the block. The terminal will then wait until it receives an ESC 5 from the computer before it begins transmission. When Immediate (IMMED) Mode is selected the terminal transmits the block immediately after the Enter key is pressed. The default selection is Immediate (IMMED).</p>
ERASE ALL/ UNPRTCT	<p>Erase All/Unprotected.* This feature determines which characters on the screen can be edited by the computer. When unprotected (UNPRTCT) mode is selected, the computer can only edit characters that are unprotected (see the Protection feature in Status Line Set 8). When all (ALL) mode is selected, the computer can edit all characters displayed on the screen. The default selection is ALL.</p>

SET 8 OF THE STATUS LINE

SET 8	EDIT EXEC IMMED	PROTECT ON/OFF	BOLD	UL	BLINK	REV	NORM
	EDIT EXEC DEFR						

**EDIT EXEC
IMMED/DEFR**

Edit Execution Immediate/Deferred.* This feature determines how the Edit function key operates. When Deferred (DEFR) Mode is selected, the computer must echo back the edit command sent by the terminal in order for the terminal to change its Edit Mode (either interactive to edit or vice versa). When Immediate (IMMED) Mode is selected, the terminal changes the mode immediately without computer intervention. The default selection is Immediate (IMMED).

PROTECT ON/OFF

Protection On/Off.* This field pertains to the remaining selections on the Set 8 Status Line. It cannot be entered. The other fields (Bold, UL (underline), Blink, Rev (reverse), and Norm) are protected if they are displayed in bold intensity video or are unprotected if they are displayed in standard intensity video. Default for these attributes is OFF. The selection of protection for one of the above fields means that all characters with those attributes are protected.

SET 9 OF THE STATUS LINE

SET 9	US CHAR	SPACE COMP OFF	EOL RTN	PAGE BOTTOM: nn
	nn CHAR	SPACE COMP ON	EOL nn	

US CHAR

Character Set.* This field selects the character set as the G0 character set (see the Select Character Set (SCS) escape sequence in the PROGRAMMER INFORMATION Section for more information). The standard character set supports United States, United Kingdom, Spanish, French, and German.

SPACE COMP
OFF/ON

Space Compression Off/On.* This field determines if unused character positions at the end of a field are transmitted as space characters (20H) or as a single record separator character (RS 1EH). The default selection is OFF.

EOL RTN

End-of-Line Return. This feature determines the character used to indicate the end of a line during block transmission. The end-of-line character can be the characters transmitted by Return (as determined by the auto-linefeed feature), the record separator character, or none. Note that when the turn-around disconnect feature uses carriage return (CR) as the end of block character, the end-of-line character is a record separator (RS) regardless of the end-of-line character feature that was selected. The default selection is RTN.

PAGE BOTTOM

Page Bottom.* This feature determines terminal page length and is only active during Auto Page Mode. A page cannot be less than 24 lines and cannot exceed 96 lines when using an 80 column display with the expanded page option installed. This feature can be used, for example, to set the page length of the terminal to the page size of the printer. The space bar is used to select the Page Bottom value. This field can also be programmed from the host. Default value will be all available lines.

OPERATOR FUNCTIONS

The following operator functions and general topics are described below: how to set and modify Tab settings; how to print information from the screen to an auxiliary printer; how to select character sets; and set protection attributes for characters.

TAB CONTROL

The tab key generates the tab (TAB 09H) control character. The tab key moves the cursor forward to the first occurrence of one of the following positions:

1. Next unprotected field;
2. Next unprotected tab position;
3. Bottom margin.

In Edit Mode, the tab key performs a line wrap-around and moves to the next position as discussed above.

In Edit Mode, holding down the Shift key and pressing the Tab key moves the cursor back to the first occurrence of one of the following:

1. Start of current unprotected field;
2. Previous unprotected field;
3. Last unprotected tab position; or
4. Line wraparound.

The tab key does not perform a line wrap-around when in Interactive Mode. The cursor stops at the left margin. In addition, the backtab function (Shift tab) does not function in Interactive Mode.

The Tab line on the QVT-103 is manipulated from within the Setup feature (see "Definition of Status Line and Setup Features" earlier in this section for a detailed discussion of Setup). The Tab line is the second line in Setup and consists of a normal video string of numbers grouped in tens by underlining every other group. Positions where tabs are set are shown in reverse video. An illustration of the Tab line is shown below:

12345678901234567890123456789012345678901234567890123456789012345678901234567890

Default Tabs

The default tab setting is one tab every eight column. This can be set by executing the following steps:

1. Enter the Setup Mode;
2. Hold down the Shift key and press "T"; and
3. Press the Setup key to exit the Setup Mode.

Setting Tabs

To set tabs execute the following steps:

1. Enter the Setup Mode;
2. Press the down cursor control key once to access the Tab Line;
3. Use the right and left cursor control keys to move the cursor to the desired tab stop position;
4. Press the Tab key to set the tab. Immediately the cursor will disappear. Press the left or right cursor control key and the reverse video tab setting will appear at the location where the tab was set;
5. Continue to set tabs as needed; and
6. When finished, exit Setup by pressing the Setup key.

Clear Tabs

To clear tabs execute the following steps:

1. Enter the Setup Mode;
2. Press the down cursor control key once to access the Tab Line;
3. Use the right and left cursor control keys to move the cursor to the tab stop position to be deleted;
4. Hold down the Control key (Ctrl) and press the Tab key. The reverse video for the tab setting will be removed; indicating that the tab setting has been cleared; and
5. To clear all tabs press the Shift key and the Tab key while in any position on the tab line. All tabs will disappear. The cursor will remain in its current position.
6. When finished exit Setup by pressing the Setup key.

Note that the Return key will position the cursor to column one of the tab line. In addition, to avoid confusion the first time tab settings are set or removed do not use the block steady (BS) cursor type (see Set 1 of the Status Line).

PRINTING

The QVT-103 video terminal has a built-in serial printer interface that connects to an optional printer. The terminal can perform four print operations: Auto Print (one line at a time), Print Screen, Printer Controller, and Print Cursor Line, any of these operations can be selected by the computer with the terminal On-Line. The Print Screen and Auto-Print Operations can be performed from the terminal keyboard or via Escape Sequences (in either On-Line or Off-Line Modes). In Off-Line Mode, the keyboard will lock until a print operation is complete. The Print Controller and Print Cursor Line commands are selected via Escape Sequences only.

The QVT-103 has a dedicated Print function key (labeled Print) which can perform the Print Screen or Auto Print operations.

Print Screen

The Print key when used alone will print a copy of the screen. Either the full screen or the current scrolling region will be printed depending on the Setup feature that has been selected (see Set 4 of the Status Line). The scrolling region of the screen is between the top and bottom margins. In the case where the Protected Transfer feature (see Set 7 of the Status Line) is on, only unprotected characters will be printed. If the Page Bottom feature has been set to a value greater than the current screen size, the print screen command may print more than the current display because the bottom margin may lie beyond the bottom of the display. This is only the case if Auto Page Mode is selected.

Auto Print

This operation prints the current line before the cursor moves to the next line. The cursor will move to the next line after the terminal receives a linefeed, form feed, or vertical tab character. This character is also transmitted to the printer at the end of the printed line.

If the line wrap feature is on (Set 2 of the Status Line), characters received when the cursor is at the right margin are automatically displayed beginning at the left margin of the next line. Before the cursor moves to the next line, however, the current line is printed. The line that is printed ends with a carriage return and linefeed characters. To use the Auto-Print Mode:

Hold down the Control (Ctrl) key and press the Print key to turn the auto print function on or off (note that auto print mode does not function while in edit mode).

If Auto Print Mode is used On-Line:

1. Any characters keyed from the keyboard are transmitted through the main terminal port.
2. If linefeed (0AH), Backtab (0BH), or form feed (OCH) is received, the current line that is printed from the screen will be in the format DATA + Cr (ODH) + (LF or VT or FF)
3. If CR LF (OAH ODH) is received, the current line from the screen to the printer will be in the format DATA + CR + LF.

If Auto Print is used Off-Line:

1. Control G rings the terminal bell.
2. Control H causes a backspace.
3. Control I causes a tab.
4. Control J or K or L same as entry 2 above for On-Line auto print mode.
5. Control M causes a carriage return.
6. Control X causes a cancel action.
7. Control Z causes a cancel action.

Print Controller

This operation can only be selected from the computer. It gives the computer direct control of the printer. When Print Controller is selected, characters are sent directly to the printer from the terminal and are not displayed on the screen.

In Printer Controller Mode and On-Line Mode:

1. All characters entered at the keyboard are transmitted to the host computer; and
2. All received data, except the printer controller off command sequence (ESC [4 i), go to the printer port.

In Printer Controller Mode and Off-Line Mode:

1. All control characters except ESC (1BH), DC1 (11H), and DC3 (13H) go to the printer port immediately; and
2. All displayable characters display on the screen.

Print Cursor Line

This operation prints the current line. The cursor position on the line does not change. See the Media Copy escape sequence in the PROGRAMMER INFORMATION Section for a discussion of this operation.

OPERATION

After the terminal transmits the line's last printable character, the terminal transmits a carriage return (CR 0DH) and linefeed (LF 0AH). The terminal does not transmit a space character after the last printable character of the line.

If a line has double-height characters (see the PROGRAMMER INFORMATION Section for details), the characters are printed as two identical lines of single-height characters. Double-width characters are printed as single-width characters on a single line.

Characters with the attributes (Bold, Reverse Video, Blink, Underline) are printed as standard intensity characters.

The United Kingdom pound sign is printed as '#' (23H).

For an explanation of how special character sets are printed see "Other ANSI Compatible Sequences" in the PROGRAMMER INFORMATION Section. In addition, control codes are sent to the printer without any conversion.

AUTO/MANUAL PAGE MODE

The Auto/Manual Page Mode located in Set 1 of the Status Line modifies the way the terminal page memory is used. In Manual Page Mode, the page memory is divided into separate pages of 24 lines each. In Auto Page Mode, all of the terminal's page memory (48 or 96 in 80 column mode or 24 or 48 in 132 column mode) is available as a single page. A special feature of the QVT-103 called Page Bottom (see Set 9 of the Status Line) can be used in Auto Page Mode to set the terminal page size to match the page format size of an auxiliary serial printer. Thus the terminal can be used in Off-Line Mode as a typewriter-like device without the typical limitations of small page size imposed by most terminals.

The following points describe the use of the Page Bottom feature in conjunction with the Auto/Manual Page Mode feature.

1. To set Page Bottom, an Escape sequence or the Setup Line can be used. The command ESC [= ** q can be used from the host computer or from the keyboard. Where ** must be two ASCII values each between 30H and 39H. For example ESC [= 3635q sets page bottom to 65 lines. The Page Bottom entry within Set 9 of the Status Line also can be set to a value of 24 through 96 by depressing the Space bar.

2. The default values for Set Bottom will be 24, 48 or 96 lines, depending on how much memory is installed and the number of columns selected.
3. The Page Bottom field is located in Set 9 of the Status Line and will display the value set or the default value. This field is saveable.
4. If an attempt is made to program Page Bottom to a value greater than the available memory size, the default value will be entered. If less than 24 lines are programmed (using the Escape sequence) then Page Bottom will be set to 24 lines.
5. If no value is programmed or previously saved, the default value will be entered.
6. Changes in the page size will occur upon exiting Setup.
7. When changing between Auto Page Mode and Manual Page Mode, all margin values are erased.
8. When entering Auto Page Mode, the cursor will move to page 1, line 1 (the screen display may change but data is not lost).
9. When entering Manual Page Mode, the cursor will move to page 1, line 1 (the screen display may change but data is not lost).
10. When changing modes, display memory will not be cleared.
11. When in Auto Page Mode, the clear screen command (key) will cause the entire page to be cleared (down to the Page Bottom).
12. When in Auto Page Mode, the Print command will print from the top of page to Page Bottom (which may be greater than the screen size).
13. When in Auto Page Mode, if the print scrolling region is set, the printed material will be the page length minus lines outside the margins. Page length set in this case takes into account the lines outside the margins. For example, if Page Bottom is set to 65 lines and 5 lines are outside the scrolling region, then only 60 lines will be printed when Page Print is executed.

CHARACTER SETS

Character Set Selection

The QVT-103 has 5 character sets, any two of which are active at one time. Each of these character sets consist of 127 characters. Some of these characters are only accessible when in Monitor Mode. The computer uses the select character set (SCS) escape sequence to designate the two active character sets as G0/ and G1. Once the two sets are selected, a single control character switches from the use of one to the other. Shift In (Control O) invokes the G0/ set and Shift Out (Control N) invokes the G1 set. The designated sets are active until another SCS control sequence is received. See "Other ANSI Compatible Sequences" in the PROGRAMMER INFORMATION Section for details of character set selections and a listing of the special graphics characters.

Character Attributes and Protection

The terminal can modify the display of characters on the screen without modifying the characters themselves. Characters can have any of the following attributes:

1. Normal Video.
2. Underline.
3. Reverse Video (character background opposite the screen background feature).
4. Blink.
5. Bold (increased intensity).
6. Any combination of the above.

Selecting one attribute has no effect on the selection of any other attribute. When a character attribute is selected, all characters received by the terminal are displayed with that attribute. If characters are moved on the screen via scrolling, attributes are moved with the characters. Attributes may be set in one of two ways: through the Setup lines or using escape sequences. See "Definition of Status Line and Setup Features" in this section for information on setting the attributes via Setup, and see the PROGRAMMER INFORMATION Section for a discussion of escape sequence usage.

In conjunction with character attributes the terminal allows the selection of character protection options. Character protection modifies the way characters with a particular attribute are edited and transmitted. When a character attribute is protected, all

characters of that type cannot be changed, overwritten, erased, or moved from the keyboard. Selection of a protection attribute does not affect the character attributes of displayed characters, just the manner in which they are handled. Character protection can be set from Set 8 of the Status Line or by using the Protect Field Attributes Escape sequence (see DECPRO in "Other ANSI Compatible Sequences" in the PROGRAMMER INFORMATION Section).

PROGRAMMER INFORMATION

INTRODUCTION

This section describes the command set of the QVT-103 video terminal. Topics covered in this section include: the use of terminal control commands, instructions for programming function keys, and system testing. This section is presented with the assumption that the reader is familiar with previous sections of this manual.

TERMINAL CONTROL COMMANDS

The QVT-103 video terminal has many control command sequences that cause it to take action other than simply displaying characters on the screen. These control command sequences allows the computer to command the terminal to perform a large number of activities; for example, the terminal can delete characters, change the character set or ring the terminal bell all under direct command from the computer.

CONTROL CHARACTERS

Control Characters are single character control functions which start, modify, or stop terminal operations. These control functions are not displayed unless the terminal is placed in Monitor Mode (see "Definition of Status Line and Setup Features" in the OPERATION Section of this manual). Appendix G contains a summary of control functions including hexadecimal representation, keystrokes necessary to generate the codes, a short description of the codes, and the manner in which they are displayed. The terminal ignores all other control characters not listed in the Appendix.

ESCAPE AND CONTROL SEQUENCES

Escape and control sequences control terminal operation and can originate from either the keyboard or the computer. These sequences are multiple character control functions that are not displayed when input. Detailed coverage of these sequences may be found in "Valid Command Sequences" later in this section.

PROGRAMMABLE FUNCTION KEYS

The QVT-103 video terminal has 12 programmable functions (4 programmable function keys) in the auxiliary (numeric) keypad that may be used to generate user-defined functions. While each key on the auxiliary keypad generates a predetermined set of control

sequences, the programmable function keys can be used to meet unique requirements of the user. A discussion of the programmable function keys and the auxiliary keypad is presented below.

HOW TO PROGRAM THE FUNCTION KEYS

Each of the 12 programmable functions can execute a maximum of 20 keystrokes. The total memory available to the functions is 240 keystrokes. The programmable function keys allow the user to store long, often-used routines in the terminal's memory. These routines can be later executed with the touch of just one or two keys. The QVT-103 has four keys located at the far right of the keyboard above the numeric keypad that are labelled PF1 through PF4. These four keys when individually pressed generate programmable functions 1 through 4, when each is used with the Shift key, programmable functions 5 through 8 are generated, and when each is used with the Control key, programmable functions 9 through 12 are generated.

There are two methods of programming the 12 function keys. The first method uses an Escape sequence and the second uses the Answerback message field located on Set 3 of the Status Line. The procedures for using each are presented below:

The Escape sequence used to program the function keys is a ANSI Device Control String. It is described below:

Command: ESC P key-number: key message; key-number: key message;. . . ; key-number: key message ESC \

where:

P means ANSI Device Control String (DCS).

: means key message introducer code.

; means key number delimiter code.

key number is

1 or 01 for PF1

2 or 02 for PF2

3 or 03 for PF3

4 or 04 for PF4

5 or 05 for SHIFT and PF1

6 or 06 for SHIFT and PF2

7 or 07 for SHIFT and PF3

8 or 08 for SHIFT and PF4

9 or 09 for CONTROL and PF1

10 for CONTROL and PF2

11 for CONTROL and PF3

12 for CONTROL and PF4

ESC \ is a string terminator code.

The key message is formatted by 2 ASCII codes to generate one real code; for example, to program a 9 (a hexadecimal 39), a 3 (hexadecimal 33) and a 9 (hexadecimal 39) must be recorded in the key message field.

When the keys are not programmed the default values for each function are in effect. These are

PF1, PF5, and PF9:ESC OP
 PF2, PF6, and PF10:ESC OQ
 PF3, PF7, and PF11:ESC OR
 PF4, PF8, and PF12:ESC OS

The following examples of function key programming should be read carefully to ensure proper understanding of the keys and their use.

The message "This is a test!" will be programmed into function key 5 by executing the following steps:

1. Put the terminal in Off-Line Mode
2. Enter ESC P
3. Enter 5 or 05 for function key 5 (PF1 and Shift)
4. Enter : (colon)
5. Enter 54686973206973206120746573742021 (These are the ASCII codes for the string "This is a test!")
6. Enter ESC \
7. Enter Setup Mode and use the down arrow cursor key to move to Set 3. Use the right arrow cursor key to move to the ANSWBK MSG: field
8. Simultaneously press the Shift and PF1 keys.
9. The string "This is a test!" should appear in the Answerback message field.

Note that legal characters for entry in key message fields are 0-9 and A-F. If a function key is pressed while in Edit Mode, the function will be sent out the EIA port.

Answerback Message Field

To program the function keys from the answerback field execute the following:

1. Enter Setup Mode;
2. Use the down arrow cursor control key to select Set 3 of the Status Line;
3. Use the right arrow cursor control key to select the Answerback field;
4. Press the function key to be programmed (PF1 through PF4, Shift with PF1 through PF4, or Control with PF1 through PF4);
5. Type a leading delimiter character. This is any character not used in the programmed function. This delimiter character is not transmitted;
6. Type in the function. Up to 20 characters can be used (These characters are the actual characters to be displayed not the ASCII codes). If a control character is used it will be displayed as its control character code.
7. Type a trailing delimiter. This must be the same character as the leading delimiter. It will not be transmitted;
8. Be certain to move the cursor to another field before saving the field (i.e. pressing the Shift and S keys); and
9. If you do not exit the Setup menu select another function key to program; but be certain to save the Setup changes by pressing the Shift and S keys if the changes are to extend beyond this current terminal session.

Note: To defeat the changes currently being made to a programmable function simply omit the last delimiter. The system will not store the current keystrokes unless the trailing delimiter is received.

To return a programmable function to the default value enter two consecutive delimiters when programming the function.

AUXILIARY KEYPAD

The auxiliary keypad located on the far right of the keyboard is normally used to transmit codes for numeric data, decimal point, minus sign, and comma. In addition, the Enter key on the keypad generates the same code as the Return key. As far as the host computer is concerned the codes generated from these keys are

equivalent to the codes generated by the corresponding keys on the alphanumeric keyboard, therefore software which requires considerable numeric data can use these keys for greater efficiency in data entry.

Instead of generating numeric characters, the auxiliary keypad can be placed in application mode which will cause it to generate special control sequences. The codes generated by the auxiliary keypad in ANSI Mode for Numeric Mode and Application Mode may be found in the "Keypad Character Selection" later in this section. The codes generated by the keypad in VT52 Mode for Numeric and Application Modes may be found in "VT52 Compatible Sequences" later in this section.

VALID COMMAND SEQUENCES

Valid QVT-103 command sequences include both ANSI (American National Standards Institute) and private command sequences. The following two paragraphs describe emulation and ANSI compatibility, and defines the syntax rules used to format Valid Command Sequences

EMULATION AND ANSI COMPATIBILITY

Emulation is the ability to make one terminal (or any other device) behave exactly like another, that is, the emulating system executes programs or processes in the native machine-language code of the emulated system. Emulation is generally used to minimize the impact of conversion from one system to another and is used to continue the use of available software.

The QVT-103 video terminal has been designed to emulate any of three Digital Equipment terminals: the VT131, VT100 and VT52. In addition, the QVT-103 is ANSI compatible. The American National Standards Institute (ANSI) has established standardized escape and control sequences for terminals in documents X3.41 - 1974 and X3.64 - 1977. Thus any terminal that is ANSI compatible can be replaced with the QVT-103 with little if any modification to the terminal configuration.

Since the VT52 uses Digital private standards the QVT-103 must be able to operate in VT52 Mode in order to properly execute VT52 control sequences.

In addition, when the ANSI standard of control and escape sequences is used the term ANSI standard will be cited.

DEFINITIONS AND SYNTAX

The following discussion introduces the syntax of the ANSI control sequences used by the QVT-103 video terminal. The ASCII representation of all characters and control codes is presented in Appendix C.

The format of an escape sequence is:

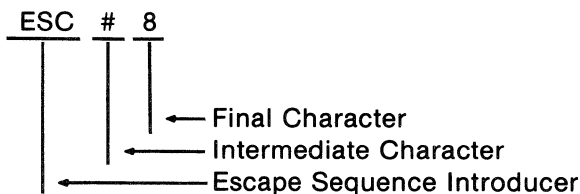
ESC	I.....I	F
01BH	020H-02FH	030H-7FH
Escape Sequence Introducer	Intermediate characters (zero or more characters)	Final character (single character)

Escape Sequence Introducer - is the ESC character (1BH) as defined by ANSI X3.4 - 1977. After ESC is received, all characters received in the proper range are not displayed but are stored for use as control functions.

Intermediate Characters - Characters received after ESC in the range 020H to 02FH (column two of the ASCII chart in Appendix C) are intermediate characters which are stored as part of the control function.

Final Characters - A character received after the ESC in the range 30H to 7FH (columns 3 through 7 of the ASCII chart in Appendix C) is a final character and indicates the end of the control function. The intermediate and final characters together define the function of the sequence. ANSI standard control functions have a final character in the 40H to 7FH range. Private sequences have a final character in the 30H to 3FH range.

Example:



Control Sequence Format

The format of a control sequence is:

CSI	P...P	I...I	F
ESC [
1BH 5BH	30H-3FH	020H-2FH	40H-7FH
Control sequence introducer	Parameter characters (zero or more characters)	Intermediate characters (zero or more characters)	Final character (one character)

Control Sequence Introducer (CSI) - is the ESC (1BH) and [(5BH) characters as defined by ANSI X3.41 - 1977. These characters are used to gain eight-bit control functions using seven-bit characters. After the CSI characters are received, all characters received in the proper range are not displayed, but are stored to be used as control functions.

Parameter Characters - Characters received after the CSI are in the 030H-03FH range. Parameter characters modify the action or interpretation of the control function. Parameter characters <=>? in the 3CH to 3FH range are interpreted as private when transmitted at the beginning of the parameter string (the : character - 3AH - is reserved). These four characters mean that a control sequence can be specified by ANSI, but the parameter function can have a private interpretation.

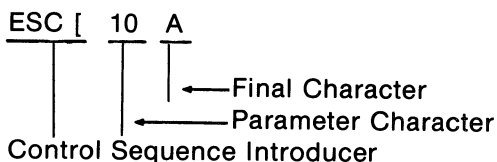
The terminal uses two types of parameter characters: numeric and selective. A numeric parameter represents a decimal number, designated as P_n. The parameters range from 0 to 9 (030H to 039H). A selective parameter is selected from a list of specified parameters and is designated by P_s.

If more than one parameter is transmitted in the control sequence, the parameters are separated by a delimiter character, the ; character (03BH).

Intermediate Characters - These are characters in the 020H to 2FH range. They are stored as part of the control function.

Final Characters - These are characters received after the CSI in the 40H to 7FH range and indicate the end of the control function. The intermediate and final characters together define the function of the sequence. ANSI standard control functions are assigned a final character in the 40H to 6FH range. Private sequences have a final character in the 70H to 7EH range.

Example:



SET AND RESET MODE SEQUENCE DESCRIPTIONS

A mode is a feature of the terminal that affects how the terminal operates. Set and Reset Mode control sequences control many of the modes of the terminal. A mode will remain in effect until the computer or operator changes the selection. A mode enabled with a Set Mode sequence is disabled using the corresponding Reset sequence and vice versa. Set and Reset Modes can be controlled via the Status Line menu and can also be controlled from the sequences described below from the computer and in some cases from the keyboard.

Table 4-1 lists Set Mode selectable parameters for each emulation.

Table 4-1. Set Mode Selective Parameters.

Set Mode (SM)	QVT-103	VT131	VT100
	ESC [Ps ; ... ; Ps h		
Guarded Area transfer (GATM)	1	1	
Keyboard Action (KAM)	2	2	2
Insert/Replace (IRM)	4	4	
Erase (EM)	6	6	
Send/Receive (SRM)	12	12	12
Transfer/Termination (TTM)	16	16	
Line /New Line (LNM)	20	20	20

Default Value: NONE

This sequence causes one or more modes to be set within the QVT-103 as specified by each selective parameter (Ps) in the parameter string (see “Definitions and Syntax” above for an explanation of the conventions used throughout this section). Each mode to be set is specified by a separate parameter. A mode is considered set until it is reset by a Reset Mode (RM) control command.

Table 4-1. Set Mode Selective Parameters (cont.)

Parameter	Parameter meaning
1	<p>GUARDED AREA TRANSFER MODE (GATM)</p> <p>Set allows all characters to be transmitted, regardless of protection.</p>
2	<p>KEYBOARD ACTION MODE (KAM)</p> <p>Set turns off the keyboard. Keyboard Action Mode is only used during full-duplex communication. This feature is always reset while entering Setup Mode.</p>
4	<p>INSERTION-REPLACEMENT MODE (IRM)</p> <p>Set selects Insertion Mode. Insertion Mode allows characters to be added to a line without erasing previously displayed characters. Previously displayed characters move to the right. Characters moved into the next field or past the right margin are lost.</p>
6	<p>ERASE MODE (ERM)</p> <p>Set allows all characters to be erased by the erase in line (EL) and erase in display (ED) command, regardless of character protection.</p>
12	<p>SEND-RECEIVE MODE (SRM)</p> <p>Set turns off local echo. Characters are transmitted only to the host computer.</p>
16	<p>TRANSFER TERMINATION MODE (TTM)</p> <p>Set selects full page transmission. The complete scrolling region is transmitted (full page).</p>

Table 4-1. Set Mode Selective Parameters (cont)

20	<p>LINEFEED/NEW LINE MODE (LNM) Set causes a received linefeed, form feed, or vertical tab to move the cursor to the first column of the next line.</p> <p>Pressing the Return key transmits both a carriage return and linefeed.</p>
----	--

Table 4-2 lists Reset Mode selectable parameters for each emulation.

Table 4-2. Reset Mode Selective Parameters

Reset Mode (RM)	QVT-103	VT131	VT100
	ESC [Ps ; . . . ; Ps I*		
Guarded Area Transfer (GATM)	1	1	
Keyboard Action (KAM)	2	2	2
Insert/Replace (IRM)	4	4	
Erase (EM)	6	6	
Send/Receive (SRM)	12	12	12
Transfer/Termination (TTM)	16	16	
Line /New Line (LNM)	20	20	20

Default Value: NONE

Note: I* denotes a lowercase L.

Table 4-2. Reset Mode Selective Parameters (cont)

Parameter	Parameter meaning
1	GUARDED AREA TRANSFER MODE (GATM) Reset allows only the unprotected character field to be transmitted. When transmitting to the computer, protected fields are replaced with the record separator character (RS 1EH). When transmitting to the printer, protected fields are replaced by space characters (SP 20H).
2	KEYBOARD ACTION MODE (KAM) Reset turns on the keyboard.
4	INSERT-REPLACEMENT MODE (IRM) Reset selects the Replacement Mode. Characters displayed replace previously displayed characters at the cursor position. The character previously at the cursor position is erased and the new character is displayed.
6	ERASE MODE (EM) Reset permits only unprotected characters to be erased. The erase in line (EL) and erase in display (ED) command do not erase protected characters.
12	SEND-RECEIVE MODE (SRM) Reset selects local echo. Characters transmitted to the host computer are automatically displayed on the screen.
16	TRANSFER TERMINATION MODE (TTM) Reset selects partial page transmission. A partial page is the area of the screen between the partial page marker and the cursor. The partial page marker is a marker in the display memory that is not displayed on the screen. If the partial page transmit marker is not present or the cursor is before the marker, the starting point is the beginning of the scrolling region.
20	LINE/NEW LINE MODE (LNM) Reset causes a received linefeed, form feed, or vertical tab to move the cursor to the next line in the current column. Pressing the Return key transmits a carriage return.

Table 4-3 lists DEC Set Mode selective parameters for each emulation.

Table 4-3. DEC Set Mode Selective Parameters

DEC Set Mode (DECSM)	QVT-103	VT131	VT100
	ESC [? Ps ; ... ; Ps h		
Cursor Key (DECCKM)	1	1	1
ANSI Mode (DECANM)	2	2	2
Column (DECCOLM)	3	3	3
Scroll (DECSCLM)	4	4	4
Screen Mode (DECSCLM)	5	5	5
Origin (DECOM)	6	6	6
Line Wrap (DECAWN)	7	7	7
Auto Repeat (DECARM)	8	8	8
Editing (DECEDM)	10	10	
Line Transmit (DECLTM)	11	11	
Space Compression/ Field Delimiter (SCFDM)	13	13	
Transmit Execution (DECTEM)	14	14	
Edit Key Execution (DECEKEM)	16	16	
Printer Form Feed (DECPFF)	18	18	
Printer Extent (DECPEX)	19	19	

Default Value: NONE

Table 4-3 DEC Set Mode Selective Parameters (cont)

Parameter	Parameter meaning
1	<p>CURSOR KEY MODE (DECCKM) Set selects cursor keys to generate control (application) functions.</p> <p>CURSOR UP ESC O A</p> <p>CURSOR DOWN ESC O B</p> <p>CURSOR FORWARD ESC O C</p> <p>CURSOR BACKWARD ESC O D</p>
2	<p>ANSI MODE Causes terminal to remain in ANSI Mode.</p>
3	<p>COLUMN MODE (DECCLM) Set selects 132 columns per line.</p>
4	<p>SCROLL MODE (DECSCLM) Set selects smooth scrolling. Smooth scrolling allows lines to be added to the screen at five lines per second (power feature = 60 HZ), or four lines per second (power feature = 50 HZ).</p>
5	<p>SCREEN MODE (DECSCNM) Set selects a reverse video screen.</p>
6	<p>ORIGIN MODE (DECOM) Set selects home position in the scrolling region. Line numbers are relative to the top margin of the scrolling region.</p>
7	<p>LINE WRAP MODE (DECAWM) Set selects line wrap. Any display characters received when the cursor is at the right margin are displayed on the next line. The display scrolls up if the cursor is at the end of the scrolling region.</p>

Table 4-3 DEC Set Mode Selective Parameters (cont)

Parameter	Parameter meaning
8	AUTO REPEAT (DECARM) Set selects auto repeat. Pressing a key for more than one-half second automatically repeats that key at the speed of 30 HZ (30 characters per second).
10	EDITING MODE (DECEDM) Set selects Edit Mode.
11	LINE TRANSMIT (DECLTM) Set selects Line Transmit Mode. While in the Edit Mode, characters are transmitted by line. The terminal transmits the line with the cursor. During a line transmission, the cursor moves to the first unprotected field on the line. If linefeed/new line (LNM) is set, the cursor moves to the first unprotected field in the next line. If the cursor is at the end of the scrolling region, the cursor moves to the first unprotected field of the current line.
13	SPACE COMPRESSION/FIELD DELIMITER MODE (SCFDM) Set selects space compression/field delimiting. Trailing spaces of fields are not transmitted. All fields transmitted end with a single record separator character except the last field on a line. The last field ends with a carriage return, carriage return-line feed, or a record separator.
14	TRANSMIT EXECUTION MODE (DECTEM) Set selects immediate character transmission.
16	EDIT KEY EXECUTION MODE (DECEKEM) Set selects immediate response to the Shift and Edit key sequence. The key sequence causes the terminal to immediately switch between Interactive and Edit Modes.

Table 4-3 DEC Set Mode Selective Parameters (cont)

Parameter	Parameter meaning
18	PRINTER FORM FEED MODE (DECPFF) Set selects form feed as the print termination character. The print termination character is transmitted to the printer at the end of each print screen.
19	PRINTER EXTENT (DECPEX) Set selects the full screen for printing during a print screen.

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Table 4-4 lists DEC Reset Mode selectable parameters for each emulation.

Table 4-4. DEC Reset Mode Selective Parameters

DEC Reset Mode (DECRM)	QVT-103	VT131	VT100
	ESC [? Ps ; ... ; Ps I*		
Cursor Key (DECCKM)	1	1	1
VT52 Mode (DECANM)	2	2	2
Column (DECCOLM)	3	3	3
Scroll (DECSCLM)	4	4	4
Screen Mode (DECSCNM)	5	5	5
Origin (DECOM)	6	6	6
Line Wrap (DECAWN)	7	7	7
Auto Repeat (DECARM)	8	8	8
Editing (DECEDM)	10	10	
Line Transmit (DECLTM)	11	11	
Space Compression/ Field Delimiter (SCFDM)	13	13	
Transmit Execution (DECTEM)	14	14	
Edit Key Execution (DECEKEM)	16	16	
Printer Form Feed (DECPFF)	18	18	
Printer Extent (DECPEX)	19	19	

Default Value: NONE

Note: I* denotes a lower case L.

Table 4-4. DEC Reset Mode Selective Parameters (cont)

Parameter	Parameter meaning
1	CURSOR KEY MODE (DECKM) Reset selects cursor keys to generate the ANSI cursor control sequence. CURSOR UP ESC [A CURSOR DOWN ESC [B CURSOR BACKWARD (LEFT) ESC [D CURSOR FORWARD (RIGHT) ESC [C
2	VT52 MODE (DECANM) Reset selects private Digital Equipment sequence compatibility while in the ANSI Mode, and VT52 Emulation Mode.
3	COLUMN MODE (DECCOLM) Reset selects 80 columns per line.
4	SCROLL MODE (DECSCLM) Reset selects jump scrolling. Jump scrolling allows lines to be added to the screen as fast as possible.
5	SCREEN MODE (DECSCNM) Reset selects normal screen.
6	ORIGIN MODE (DECOM) Reset selects home position in the upper-left corner of the screen. Line numbers are independent of the scrolling region (absolute).
7	AUTO WRAP MODE (DECAWM) Reset turns auto wrap off. Display characters received when the cursor is at the right margin replace the the previously displayed character in that position.

Table 4-4. DEC Reset Mode Selective Parameters (cont)

Parameter	Parameter meaning
8	AUTO REPEAT MODE (DECARM) Reset turns off auto repeat. Keys do not automatically repeat when pressed.
10	EDITING MODE (DECEDM) Reset selects Interactive Mode.
11	LINE TRANSMIT (DECLTM) Reset selects full or partial page transmission as determined by the Transfer Termination Mode.
13	SPACE COMPRESSION/FIELD DELIMITING Reset turns off space compression/field delimiting. Characters are transmitted as displayed on the screen. All character positions that do not display characters actually contain space characters.
14	TRANSMIT EXECUTION MODE (DECTEM) Reset selects deferred character transmissions.
16	EDIT KEY EXECUTION MODE (DECEKEM) Reset selects deferred response to the SHIFT and EDIT key sequence.
18	PRINTER FORM FEED MODE (DECPFF) Reset does not select a print termination character.
19	PRINT EXTENT MODE (DECPEX) Reset selects the scrolling region for printing during a print screen.

Table 4-5 lists Qume Set Mode selectable parameters for each emulation.

Table 4-5. Qume Set Mode Selective Parameters

Set Mode (SM)	QVT-103	VT131	VT100
Qume Private	ESC [= Ps ; ... ; Ps h		
Auto Page Mode	20		
Suppress 25th Line	30		
Status Line Reverse Video	31		

Default Value: NONE

Parameter	Parameter meaning
20	<p>AUTO PAGE MODE</p> <p>When Edit Mode is off, all available lines (48 or 96) become page 1 unless Bottom of Page is programmed to be less than the maximum number of lines. Bottom of Page determines page length. Scroll down works until top margin is reached. Scroll up works until bottom margin is reached. The scrolling rows are not erased.</p>
30	<p>SUPPRESS 25TH LINE</p> <p>Set suppresses the Status Line on the display.</p>
31	<p>STATUS LINE REVERSE VIDEO</p> <p>Set displays the Status Line in the opposite video that is selected for the full screen.</p>

Table 4-6 lists Qume Reset Mode selectable parameters for each emulation.

Table 4-6. Qume Reset Mode Selective Parameters

Reset Mode (RM)	QVT-103	VT131	VT100
Qume Private	ESC [= Ps ; ... ; Ps l*		
Manual Page Mode	20		
Display 25th Line	30		
Status Line Normal Video	31		

Default Value: NONE

Note: l* denotes a lowercase L.

Parameter	Parameter meaning
20	<p>MANUAL PAGE MODE Reset defines a page as 24 lines. The scrolling regions are erased.</p>
30	<p>DISPLAY 25TH LINE Reset displays the Status Line as the 25th line on the display.</p>
31	<p>STATUS LINE NORMAL VIDEO Reset displays the Status Line in the same video that is selected for the full screen.</p>

OTHER CONTROL SEQUENCE DESCRIPTIONS

There are two types of control sequences in addition to the Set and Reset sequences: ANSI compatible and VT52 compatible sequences. These are described below.

OTHER ANSI COMPATIBLE SEQUENCES

The control sequences described below are the ANSI compatible sequences excluding the Set and Reset sequences described above. Table 4-7 lists these functions and their mnemonics.

Table 4-7. ANSI Control and Escape Features

Function	Feature	Mnemonic
Scrolling	Scroll Up Scroll Down Next Page Previous Page Set Top and Bottom Margins	SU SD NP PP DECSTBM
Cursor Positioning	Cursor Up Cursor Down Cursor Forward Cursor Backward Cursor Position Horizontal and Vertical Position Cursor Home Position Home Index Reverse Index Next Line Save cursor Restore Cursor	CUU CUD CUF CUB CUP HVP CUP HVP IND RI NEL DECSC DECRC
Character Set Selection	Select Character Set Single Shift Single Shift Select Graphics Rendition Double Height Line - Top Double Height Line - Bottom Single-Height Single-Width Line Single-Height Double-Width Line	SCS SS2 SS3 SGR DECDHL DECDHL DECSWL DECDWL

Table 4-7. ANSI Control and Escape Features (cont)

Function	Feature	Mnemonic
Character Protection	Protected Fields	DECPRO
Editing	Erase in Display Erase in Line Delete Character Insert Line Delete Line	ED EL DCH IL DL
Keypad Character Selection	Numeric Keypad Application Keypad	DECKPNM DECKPAM
Printing	Media Copy	MC
Programmable Function Keys		
Reports	Device Status Report Cursor Position Device Attribute Identify Terminal Printer Report Request Terminal Parameters Report Terminal Parameters	DSR CPR DA DECID DECPR DECREQTPARM DECREPTPARM
Reset	Reset to Initial State	RIS
Tabs	Horizontal Tab Set Horizontal Tab Clear	HTS TBC
Tests	Invoke Confidence Test	DECTST
Transmission	Transmit Mode Set Transmit State Transmit Termination Character	DECXMIT STS DECTTC
Adjustments	Screen Alignment Display Bottom of Page	DECALN

Scrolling

Scroll Up (SU)	QVT-103	VT131	VT100
	ESC [Pn S		

Default Value: 1

When Auto Page Mode is on, this sequence causes the entire contents of the scroll region to be moved up until the bottom of page is reached. When Edit Mode is on, this command is ignored.

In Manual Page Mode, this sequence causes the scrolling region to move up. For every line scrolled up, the data on the first line of the scrolling region will be lost. A blank line will appear on the last line of the scrolling region.

In either case, the number of lines moved is determined from the parameter value (Pn). A parameter value of zero or one moves the contents of the display up one line.

The cursor position is not changed when SU command is executed.

Scroll Down (SD)	QVT-103	VT-131	VT-100
	ESC [Pn T		

Default Value: 1

When Auto Page Mode is on, this sequence causes the entire contents of the scrolling region to be moved down until the beginning of memory is reached. When Edit Mode is on, this command is ignored.

In Manual Page Mode, this sequence causes the scrolling region to move down. For every line scrolled down, the data on the last line of the scrolling region will be lost. A blank line will appear on the first line of the scrolling region.

In either case, the number of lines to be scrolled is determined by the parameter (Pn). A parameter value of zero or one, moves the contents of the display down one line.

The cursor position is not changed when SD command is executed.

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Next Page (NP)	QVT-103	VT131	VT100
	ESC [Pn U		

Default Value: 1

This sequence causes the next page of a multiple-page store to display according to the parameter (Pn). If the parameter value is zero or one, then the next page is the result.

This command is ignored when in Auto Page Mode.

Preceding Page (PP)	QVT-103	VT131	VT100
	ESC [Pn V		

Default Value: 1

This sequence causes a previous page of a multi-page store to display according to the parameter (Pn). If the parameter value is zero or one, then the preceding page is the result.

This command is ignored when in Auto Page Mode.

Set Top and Bottom Margins (DECSTBM)	QVT-103	VT131	VT100
	ESC [Pt; Pb r		

Default: Pt=1, Pb=24

This sequence sets the top and bottom margins to define the scrolling region. The parameter Pt is the line number of the first line in the scrolling region; the parameter Pb is the line number of the bottom line in the scrolling region.

The minimum size of the scrolling region allowed is two lines. After executing this feature, the cursor is placed in the home position which is set by the Origin Mode feature (see DEC Set and Reset sequences).

Cursor Positioning

Cursor Up (CUU)	QVT-103	VT131	VT100
	ESC [Pn A		

Note: Host computer to QVT-103 and QVT-103 to host computer
Default Value: 1

This sequence moves the cursor upward without altering the column position. The number of lines moved is determined by the parameter (Pn). A parameter value of zero or one moves the cursor up one line. A parameter value of n moves the cursor up n lines.

If an attempt is made to move the cursor above the top margin, the cursor stops at the top margin.

Cursor Down (CUD)	QVT-103	VT131	VT100
	ESC [Pn B		

Note: Host computer to QVT-103 and QVT-103 to host computer
Default Value: 1

This sequence moves the cursor down without altering the column position. The number of lines moved is determined by parameter (Pn). If the parameter value is zero or one, the cursor is moved down one line. If the parameter value is n, the cursor is moved down n lines. If an attempt is made to move the cursor below the bottom margin, the cursor stops at the bottom margin.

Cursor Forward (CUF)	QVT-103	VT131	VT100
	ESC [Pn C		

Note: Host computer to QVT-103 and QVT-103 to host computer
Default Value: 1

This sequence moves the cursor to the right. The distance moved is determined by the parameter (Pn). If the parameter value is zero or one, it moves the cursor one position to the right. If an attempt is made to move the cursor beyond the right margin, the cursor stops at the right margin.

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Cursor Left (CUB)	QVT-103	VT131	VT100
	ESC [Pn D		

Note: Host computer to QVT-103 and QVT-103 to host computer
 Default Value: 1

This sequence moves the cursor to the left. The distance moved is determined by the parameter (Pn). If the parameter value is zero or one, the cursor is moved one position left. If the parameter value is n, the cursor is moved left n positions. If an attempt is made to move the cursor beyond the left margin, the cursor stops at the left margin.

Cursor Position (CUP)	QVT-103	VT131	VT100
	ESC [P1* ; Pc H		

Default Value: 1
 Note: l* denotes lowercase L.

This sequence moves the cursor to the position specified by the parameters (line: P1* and column: Pc). If either P1* or Pc are omitted or selected as zero, the cursor moves to the first line or column, respectively. The default condition with no parameter present is equivalent to a cursor home action.

Numbering of lines and the ability to move the cursor into margins depends on the Origin Mode (DECOM) that has been set.

Horizontal and Vertical Position (HVP)	QVT-103	VT131	VT100
	ESC [P1* ; Pc f		

Note: Host computer to QVT-103 and QVT-103 to host computer
 Note: l* denotes a lowercase L.
 Default Value: 1

This sequence moves the cursor to the position specified by parameters (line: P1*, column: Pc). A parameter value of either zero or one causes the cursor to move to the first line or column in the display, respectively. The default condition with no parameters present moves the cursor to the home position. Line numbering and the ability to move the cursor into margins depends on the Origin Mode (DECOM) that has been set.

Index (IND)	QVT-103	VT131	VT100
	ESC D		

This sequence causes the cursor to move downward one line without changing the column position. If the position is at the bottom margin, a scroll up is performed.

Reverse Index (RI)	QVT-103	VT131	VT100
	ESC M		

This sequence moves the cursor up one line in the same column. If the cursor is at the top margin, a scroll down is performed.

Next Line (NEL)	QVT-103	VT131	VT100
	ESC E		

This sequence causes the cursor to move to the first position on the line below. If the cursor is at the bottom margin, a scroll up is performed.

Save Cursor (DECSC)	QVT-103	VT131	VT100
	ESC 7		

This sequence saves the cursor position, character attribute (graphic rendition), character set, and Origin Mode selection.

Restore Cursor (DECRC)	QVT-103	VT131	VT100
	ESC 8		

This sequence restores previously saved cursor position, character attribute (graphic rendition), character set, and Origin Mode selection.

If nothing was saved, the cursor moves to the home position.

Character Set Selection

Table 4-8 lists Select Character Set selectable parameters for each emulation.

Table 4-8. Select Character Set Selective Parameters

Select Character Set (SCS)	QVT-103	VT131	VT100
	ESC (Ps for set G0 ESC) Ps for set G1		
UK Set (G0)	ESC (A	ESC (A	ESC (A
US Set (G0)	ESC (B	ESC (B	ESC (B
Spec Character(G0)	ESC (0	ESC (0	ESC (0
Alternate ROM (G0) (see note 3 below)	ESC (1	ESC (1	ESC (1
Alternate ROM Special Character - (G0) (see note 3 below)	ESC (2	ESC (2	ESC (2
UK Set (G1)	ESC) A	ESC) A	ESC) A
US Set (G1)	ESC) B	ESC) B	ESC) B
Special Character (G1)	ESC) 0	ESC) 0	ESC) 0
Alternate ROM (G1) (see note 3 below)	ESC) 1	ESC) 1	ESC) 1
Alternate ROM -Special Character - (G1) (see note 3 below)	ESC) 2	ESC) 2	ESC) 2
German Set (G0)	ESC (C		
French Set (G0)	ESC (D		
Spanish Set (G0)	ESC (E		
German Set (G1)	ESC) C		
French Set (G1)	ESC) D		
Spanish Set (G1)	ESC) E		

This sequence will select a character set for the terminal. Two active character sets can be defined and are labelled G0/ and G1. These are designated from one of the five possible character sets. The codes for US, UK, French, Spanish, and German character sets are contained in the Appendices C through F. The codes for the special character set are discussed in note 7 of the Media Copy (MC) sequence later in this section. The G0/ and G1 sets are invoked by the command Shift In (SI), use Control O, and command Shift Out (SO), use Control N, respectively.

The designated character sets are active until another SCS sequence is received.

NOTE 1: The QVT-103 can display up to 512 different characters. Of these 512 characters, 256 display characters are held in basic ROM (read only memory). The other 256 display characters are available by installing an alternate character set ROM (optional).

NOTE 2: The United States and United Kingdom character set meet the "ISO international register of character sets to be used with escape sequence."

NOTE 3: The alternate ROM is not currently used. It is reserved for future character set enhancements.

NOTE 4: Special characters are shown below under note 7 of the Media Copy (MC) control sequence.

Single Shift 2 (SS2)	QVT-103	VT131	VT100
	ESC N		

This sequence selects the G2 (default) character set for one character. The QVT-103 then returns to the previously selected character set. The default character set is the character set selected in Setup.

Single Shift 3 (SS3)	QVT-103	VT131	VT100
	ESC 0		

This sequence selects the G3 (default) character set for one character. The QVT-103 then returns to the previously selected character set. The default character set is the character set selected in Setup.

Select Graphic Rendition (SGR)	QVT-103	VT131	VT100
	ESC [Ps ; ... ; Ps m		

Default Value: 0

This sequence invokes the graphic rendition specified by the parameters (Ps). All the following characters transmitted to the QVT-103 are rendered according to the parameter(s) until the next occurrence of SGR. Selecting an attribute does not turn off other attributes already selected.

Parameter	Parameter meaning
0	All attributes off
1	Bold or increased intensity
4	Underscore
5	Blink
7	Reverse video

NOTE: All other parameter values are ignored.

Double-Height, Double-Width Characters (DECDHL)	QVT-103	VT131	VT100
	ESC # 3 for top half ESC # 4 for bottom half		

These sequences cause the line containing the cursor to become the top or bottom half of a double-height, double-width line. If the line was single-width, single-height, all characters to the right of the center of the screen are lost. The cursor will go to the right margin position if it is beyond the center of the screen.

When erasing an entire line using the Erase Line, the double-height, double-width (top or bottom half) attribute changes to single-height, single-width.

Single-Height, Single-Width Characters (DECSWL)	QVT-103	VT131	VT100
	ESC # 5		

This sequence causes the line which contains the cursor to become single-height, single-width. The cursor remains on the same character position.

This is the line attribute for all new lines on the screen.

Single-Height, Double-Width Characters (DECDWL)	QVT-103	VT131	VT100
	ESC # 6		

This sequence causes the line with the cursor to become single-height, double-width. All characters to the right of the center of the screen are lost. The cursor will go to the right margin if it is beyond the center of the screen.

Character Protection

Protected Field Attributes (DECPRO)	QVT-103	VT131	VT100
	ESC [Ps; . . . ; Ps)		

Default Value: 0

In Edit Mode, character attributes are used to create protected or unprotected characters and fields.

PROGRAMMER INFORMATION

Parameter	Parameter meaning
0	Does not protect any character.
1	Selects bold character protection.
4	Selects underline character protection.
5	Selects blink character protection.
7	Selects reverse video character protection.
254	Selects normal video character protection.

NOTE 1: Selection of protection attributes does not change the character attributes of displayed characters.

Editing

Erase in Display (ED)	QVT-103	VT131	VT100
	ESC [Ps J		

Default Value: 0

This sequence erases some or all of the characters in the display according to the parameter (Ps). Any complete line erased by this command will return that line to single-height, single-width mode.

Parameter	Parameter meaning
0	Erase from the cursor position to the end of screen, including the cursor position.
1	Erase from start of the screen to the active position, including the active position.
2	Erase all of the display. All lines are erased and the cursor does not move.

Erase in Line (EL)	QVT-103	VT131	VT100
	ESC [Ps K		

Default Value: 0

This sequence erases some or all characters in the active line according to the parameter (Ps).

Parameter	Parameter meaning
0	Erase from and including the cursor position to the end of the line.
1	Erase from the start of the line to up and including the cursor position.
2	Erase all of the line. Use this command to erase the whole line. The line attribute does not change.

Delete Character (DCH)	QVT-103	VT131	VT100
	ESC [Pn P		

Default Value: 0

This sequence deletes Pn characters starting with the character at the cursor position. When it deletes a character from the screen, all characters right of the cursor move left. A space will be created at the right margin; its attribute is the same as the last character moved left.

In Edit Mode (DECEDM) with Erasure Mode (ERM) reset, characters moved are limited by the end of the line or field. This command is ignored when the cursor is in a protected field.

Insert Line (IL)	QVT-103	VT131	VT100
	ESC [Pn L		

Default Value: 1

This sequence inserts Pn lines at the line with the cursor. Lines below the cursor on the screen move down (including the active line). Lines moved past the bottom margin are lost. This sequence is ignored when the cursor is outside the scrolling region. In Edit Mode (DECEDM) with Erasure Mode (ERM) reset, characters moved into a line with a protected field are also lost.

Delete Line (DL)	QVT-103	VT131	VT100
	ESC [Pn M		

Default Value: 1

This sequence deletes Pn lines starting at the line with the cursor. As lines are deleted, lines displayed below the cursor move up. Lines added to the bottom of the screen are filled with spaces and have the same character attributes as the last line that was moved up. This command is ignored when the cursor is outside the scrolling region.

In Edit Mode (DECEDM) with Erasure Mode (ERM) reset, the line added to the screen is at the bottom margin or next line with a protected field.

Keypad Character Selection

Numeric Keypad Mode	QVT-103	VT131	VT100
	ESC >		

This sequence selects the Numeric Keypad Mode. The auxiliary keypad generates characters that correspond to the numeric, comma, period, and minus sign keys on the alphanumeric keyboard.

Table 4-9 lists the ANSI keypad codes generated in this mode.

Table 4-9. Numeric Keypad Mode Codes

Key	Numeric Keypad Mode
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
-	-
,	,
.	.
ENTER	CR or CRLF (depends on Linefeed/Newline Mode)
PF1	ESC O P or programmed value.
PF2	ESC O Q or programmed value.
PF3	ESC O R or programmed value.
PF4	ESC O S or programmed value.

Alternate (Application) Keypad Mode (DECKPAM)	QVT-103	VT131	VT100
	ESC =		

This sequence selects the Alternate (Application) Keypad Mode. The auxiliary keypad generates control functions.

Table 4-10 lists the Application keypad codes generated in this mode.

Table 4-10 Application Keypad Mode Codes

Key	Application Keypad Mode
0	ESC O p
1	ESC O q
2	ESC O r
3	ESC O s
4	ESC O t
5	ESC O u
6	ESC O v
7	ESC O w
8	ESC O x
9	ESC O y
- (minus)	ESC O m
, (comma)	ESC O l
. (period)	ESC O n
ENTER	ESC O M
PF1	ESC O P or programmed value.
PF2	ESC O Q or programmed value.
PF3	ESC O R or programmed value.
PF4	ESC O S or programmed value.

Printing

Media Copy (MC)	QVT-103	VT131	VT100
	ESC [P s i		

Default Value: 0

Parameter	Parameter meaning
0 (Print Screen)	Outputs all screen data to the printer. The printer prints the complete screen, or just the scrolling region, depending on Printer Extent Mode.

Parameter	Parameter meaning
4 (Printer Controller Off)	Turns off the Printer Controller Mode.
5 (Printer Controller On)	Turns on the Printer Controller Mode. All characters received by the terminal are printed by the serial printer, but not displayed. The terminal does not insert or delete spaces, provide line delimiters, or select the correct character sets in the printer. Note: this mode is equivalent to a transparent mode.

Media Copy (MC)	QVT-103	VT131	VT100
	ESC [? Ps i		

Parameter	Parameter meaning
1 (Print Cursor Line)	Causes the printer to print the line with the cursor. The cursor position does not change. The print cursor line ends when the line is printed.
4 (Auto Print Off)	Turns off the Auto Print Mode.
5 (Auto Print On)	Turns on the Auto Print Mode. A line from the screen prints when the cursor moves off the line. A linefeed, form feed, or vertical tab moves the cursor off the line. The character is also transmitted to the printer. The line prints during an auto wrap, and the line ends with a carriage return and linefeed.
NOTE 1:	Auto print is not performed in the Edit Mode, but it can be turned on or off.
NOTE 2:	When the terminal prints characters from the screen, it ignores its own tab stop and tab stop of the printer. Printed spaces are spaced using the space (SP 20H) character.

- NOTE 3:** After the terminal transmits the line's last printable character, the terminal transmits a carriage return (CR 0DH) and linefeed (LF 0AH). The terminal does not transmit a space character after the last printable character of the line.
- NOTE 4:** If a line has double-height characters, the characters are printed as two identical lines of single-height single-width characters. Double-width characters are printed as single-width characters on a single line.
- NOTE 5:** The attributed (Bold, Reverse Video, Blink, Underline) characters are printed as normal characters.
- NOTE 6:** The UK pound sign character is printed at "#" (23H).
- NOTE 7:** The special character sets are printed as below:

SHAPE	ASCII	CODE (HEX)
Diamond	,	60H
Checkerboard	SUB	1AH
Horizontal Tab	b	62H
Form Feed	c	63H
Carriage Return	d	64H
Line Feed	e	65H
Degree Symbol	f	66H
Plus/Minus	g	67H
New Line	h	68H
Vertical Tab	i	69H
Lower-right corner	j	6AH
Upper-right corner	k	6BH
Upper-left corner	l	6CH
Lower-left corner	m	6DH
Crossing Lines	n	6EH
Horizontal line (scan 1)	o	6FH
Horizontal line (scan 3)	p	70H

SHAPE	ASCII	CODE (HEX)
Horizontal line (scan 6)	q	71H
Horizontal line (scan 9)	r	72H
Horizontal line (scan 12)	s	73H
Left "T"	t	74H
Right "T"	u	74H
Bottom "T"	v	76H
Top "T"	w	77H
Vertical Bar	x	78H
Less than or equal to	y	79H
Greater than or equal to	z	7AH
Pi	}	7BH
Not equal to	|	7CH
UK pound sign	}	7DH
Centered dot	~.	7EH

NOTE 8: Control codes are sent without any conversion.

NOTE 9: In Auto Print On and On-Line Mode:

1. Any characters keyed in from the keyboard are transmitted through the main port.
2. If LF (0AH), VT (0BH) or FF (0CH) is received, it will cause the current line from the screen to print in the format DATA + CR (0DH) + (LF or VT or FF).
3. If CR LF (0DH 0AH) is received, it will cause the current line from the screen to print in the format DATA + CR + LF.

PROGRAMMER INFORMATION

- NOTE 10:** In Auto Print On and Off-Line Mode:
1. Ctrl G rings bell.
 2. Ctrl H causes a backspace.
 3. Ctrl I causes a TAB
 4. Ctrl J or K or L same as NOTE 9 entry 2 above.
 5. Ctrl M causes a carriage return.
 6. Ctrl X causes a cancel action which if received during an escape or control sequence, cancels the sequence and displays substitution characters.
 7. Ctrl Z causes a cancel action. (See 6. above)

- NOTE 11:** In Printer Controller On and On-Line Mode:
1. All characters keyed in transmit to the host computer.
 2. All received data except Printer Controller Off command sequence (ESC [4 i) go to the printer port.

- NOTE 12:** In Printer Controller On and Off-Line Mode:
1. All control characters except ESC (1BH), DC1 (11H), and DC3 (13H) go to the printer port immediately.
 2. All displayable character display on the screen.

Programmable Keys

See “How to Program the Function Keys” elsewhere in this section.

Programmable Status Field L1-L4	QVT-103	VT131	VT100
	ESC[Ps ; Ps ; ... ; Ps q		

Note: this command does not work in VT131 mode.
Default Value: 0

Loads the four programmable status fields L1-L4 on the Status Line according to the parameter(s).

Parameter	Parameter Meaning
0	Turns all fields L1-L4 off
1	Turns L1 on
2	Turns L2 on
3	Turns L3 on
4	Turns L4 on

Reports

Table 4-11 lists the report parameters for all emulations.

Table 4-11. Reports Selective Parameters

Device Status Report (DSR)	QVT-103	VT131	VT100
	ESC [Ps n		
Ready Response	0	0	0
Malfunctions Detected	3	3	3
Request Device Status	5	5	5
Cursor Position Report	6	6	6
Request Report	7		
2 Page Response	8		
4 Page Response	9		

Default Value: 0

QVT-103 transmits status reports in response to requests from the host computer. Reports determine the type of terminal status and the cursor position.

Parameter	Parameter meaning
0	Ready, no malfunctions detected. (Response from QVT-103).
3	Not ready, malfunctions detected. (Response from QVT-103).
5	Request a status report. (Command from Host Computer).
6	Request a cursor position report. (Command from Host Computer).
7	Request an installed pages report. (Command from Host Computer).

Table 4-11. Reports Selective Parameters (Cont)

Parameter	Parameter meaning
8	Two 80 column pages installed. (Response from QVT-103).
9	Four 80 column pages installed. (Response from QVT-103).
NOTE:	QVT-103 does not respond to the DSR command during the Printer Controller Mode.

Cursor Position Report (CPR)	QVT-103	VT131	VT100
	ESC [PI* ; PcR		

The terminal reports the cursor position by using the CPR sequence in response to a DSR sequence (ESC A [6 n) request from the host computer. PI* indicates the line number and Pc indicates the column number. No parameters, or zero parameters, indicate the cursor is at home position. Numbering of lines depends on the Origin Mode (DECOM).

Note: I* denotes a lower case L.

Device Attributes (DA)	QVT-103	VT131	VT100
	ESC [c or ESC [0 c		

The host computer requires the terminal to identify itself.

Response: ESC [? 7 c (QVT-103 to host computer) When in VT131 mode.

Response: ESC [? 1;2c When in VT100 mode.

Response: ESC [= 7 c When in QVT-103.

Identify Terminal (DECID)	QVT-103	VT131	VT100
	ESC Z		

The host computer asks the terminal to identify itself. The QVT 103 uses device attributes (DA) ESC [? 7 c to respond when in VT131 mode. The QVT-103 uses device attributes (DA) ESC [? 1;2c when in VT100 mode. The QVT-103 uses device attributes (DA) ESC [= 7 c when in QVT-103 mode.

Printer Report (DECPR)	QVT-103	VT131	VT100
	ESC [? 15 n		

The host computer requests a printer status report. The terminal checks the status of the printer.

Response: ESC [? Ps n (QVT-103 to Host)

Parameter	Parameter meaning
10	The printer is ready to print The printer's DTR is on.
11	The printer is not ready to print. The printer's DTR was on, but is now off.
13	No printer is connected to the terminal. The printer's data terminal ready (DTR) signal has not been on since the terminal was turned on.

Request Terminal Parameters	QVT-103	VT131	VT100
	ESC [<sol> x		ESC [<sol> x

Default: 0

This sequence is explained below in Report Terminal Parameters.

Parameter	Value	Parameter meaning
<sol>	0 or none	This message is a request from the host computer. The terminal will be allowed to send unsolicited reports. Unsolicited reports are sent when the terminal exits Setup Mode.
	1	This message is a request; from now on the terminal may only report in response to a request.

Report Terminal Parameters (DECREPTPARM)	QVT-103	VT131	VT100
	ESC [<sol>;<par>;<nbits>;<xspeed>;		
	<rspeed>;<clkmul>;<flags>x		

Note: this command does not function in VT131 mode.

The sequence DECREPTPARM is sent by the terminal controller to notify the host of the status of selected terminal parameters. The status sequence may be sent when requested by the host computer or at the terminal's discretion. DECREPTPARM is sent upon receipt of a DECREQTPARM. On power-up or reset, the terminal is inhibited from sending unsolicited reports.

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Parameter	Value	Parameter meaning
	2	This message is a report.
	3	This message is a report and the terminal is only reporting upon request.
<par>	1	No parity.
	4	Odd parity.
	5	Even parity.
<nbits>	1	8 bits per character.
	2	7 bits per character.
<xspeed> and	0	50 bits per second (baud rate)
	8	75
<rspeed>	16	110
	24	134.5
	32	150
	40	200
	48	300
	56	600
	64	1200
	72	1800
	80	2000
	88	2400
	96	3600
	104	4800
	112	9600
	120	19200
	Note:	xspeed is the transmitted baud rate. rspeed is the received baud rate.
<clkmul>	1	The bit rate multiplier is 16.
<flags>	0	These flags are not available.

Reset

Reset to Initial State (RIS)	QVT-103	VT131	VT100
	ESC c		

This sequence resets the terminal to its initial state.

Tabs

Horizontal Tabulation Set (HTS)	QVT-103	VT131	VT100
	ESC H		

This sequence sets a horizontal tab stop at the cursor position.

Tabulation Clear (TBC)	QVT-103	VT131	VT100
	ESC [Ps g		

Default Value: 0

This sequence clears the tab stops as follows:

Parameter	Parameter meaning
0	Clear the horizontal tab stop at the active position.
3	Clear all horizontal tab stops.

NOTE: Any other parameter values are ignored.

Tests

Table 4-12 lists DEC Test selectable parameters for each emulation.

Table 4-12. DEC Test Selective Parameters

Tests (DECTST)	QVT-103	VT131	VT100
	Esc [2 ; Ps y		
Power Up Self-Test	1	1	1
Data Loopback Test	2	2	2
EIA Loopback Test	4	4	4
Continuous Power Up Test	9	9	9
Continuous Data Loopback Test	10	10	10
Continuous EIA Loopback Test	12	12	12
Printer Loopback Test	16	16	
Continuous Printer Loopback Test	24	24	

Self-test provides error indications on the screen. Ps is the parameter indicating the test to be done. The test results (pass or fail) are also reported to the host computer by a device status report (DSR) command.

Parameter	Parameter meaning
1	Starts the power-up test; the terminal resets and performs the power-up test.
2	Starts the data loopback test. This test needs a loopback connector on the modem interface connector.
4	Starts the EIA loopback test. This test needs a loopback connector on the modem interface connector.

Table 4-12. DEC Test Selective Parameters (cont)

Parameter	Parameter meaning
9	Repeats power-up test continuously until a failure or power-off.
10	Repeats data loopback test continuously until a failure or power-off. This test needs a loopback connector on the modem interface connector.
12	Repeats EIA loopback test continuously until a failure or power-off. This test needs a loopback connector on the modem interface connector.
16	Starts the printer loopback test. This test needs a loopback connector on the printer interface connector.
24	Repeats printer loopback test continuously until a failure or power off. This test needs a loopback connector on the printer interface connector.

Transmission

Set Transmission State (STS)	QVT-103	VT131	VT100
	ESC S	ESC S	

In Edit Mode, this sequence is transmitted to the computer to request a character block transmission.

This sequence (STS) is only transmitted when Transmit Execution Mode (DECTEM) is reset.

Transmit Mode (DECXMIT)	QVT-103	VT131	VT100
	ESC 5	ESC 5	

This sequence causes the terminal to transmit a character block.

Transmit Termination Character (DECTTC)	QVT-103	VT131	VT100
	ESC [Ps |		

Default Value: 0

In Edit Mode, a control character can be selected to indicate the end of a transmitted character block.

Parameter	Parameter meaning
0	Selects no end of block character.
1	Selects form feed (FF 0CH) as the end of block character.
2	Selects end of text (ETX 03H) as the end of block character.
3	Selects end of transmission (EOT 04H) as the end of block character.
4	Selects carriage return (CR 0DH) as the end of block character.
5	Selects DC3 (13H) as the end of block character.

Adjustments

Screen Alignment Display (DECALN)	QVT-103	VT131	VT100
	ESC # 8		

This command fills the screen with uppercase letter Es for video alignment, and resets scroll margin to default (no margin). The cursor displays at the home position. The center of the screen displays the revision level of the firmware.

Page Bottom	QVT-103	VT131	VT100
	ESC [= nn q		

This command determines the terminal page length and is only active in Auto Page Mode. A page cannot be shorter than 24 lines and cannot exceed the available memory (48 lines of 80 columns or 24 lines of 132 columns with a standard QVT-103, or 96 lines of 80 columns or 48 lines of 132 columns with the 2 page expansion option).

The variable nn is a pair of ASCII values between 30H and 39H. These values represent the numbers 0 through 9. By using two numbers the page bottom can be programmed to be any allowable number from 24 to 96. Default value will be all available memory.

This function can also be set from Set 9 of the Status Line (labelled Page Bottom).

VT52 EMULATION MODE SEQUENCES

The following sequences are activated via the ESC [? 2 | * sequence:

Note: l* denotes a lowercase L.

ANSI Mode (DECANM) Command: ESC <

VT52 command sequences are no longer recognized; the QVT-103 enters ANSI Mode. All sequences are interpreted according to ANSI standards X3.64-1979 and X3.41-1974.

Cursor Up Command: ESC A

Moves the cursor up without altering the column position; if an attempt is made to move the cursor above the top margin, the cursor stops at the top margin.

Cursor Down Command: ESC B

Moves the cursor down without altering the column position; if an attempt is made to move the cursor below the bottom margin, the cursor stops at the bottom margin.

Enter Graphics Mode

Command: ESC F

Selects the special graphics character set and line drawing character set. The QVT-131, VT131, and VT100 use different graphics mode characters than the VT52. Table 4-13 compares the QVT-103/VT131/VT100 Special Character and Line Drawing Character Set to the VT52 Graphics Mode (character set).

Table 4-13 lists Special Character and Line Drawing Sets for VT52 emulation.

Table 4-13. VT52 Special Character and Line Drawing Sets

Code (HEX)	ASCII	Special characters and line drawing set	VT52 Graphic Mode set
5FH	—	BLANK	BLANK
60H	,	Diamond	Reserved
61H	a	Checkerboard (error indicated)	Solid rectangle
62H	b	Horizontal tab	1/
63H	c	Form feed	3/
64H	d	Carriage Return	5/
65H	e	Line feed	7/
66H	f	Degree symbol	Degrees
67H	g	Plus/minus	Plus/minus
68H	h	new line	right arrow
69H	i	Vertical tab	Elipsis (dots)
6AH	j	Lower-right corner	Divide by
6BH	k	Upper-right corner	Down arrow
6CH	l	Upper-left corner	Bar at scan 0
6DH	m	Lower-left corner	Bar at scan 1
6EH	n	Crossing lines	Bar at scan 2
6FH	o	Horizontal line (scan 1)	Bar at scan 3
70H	p	Horizontal line (scan 3)	Bar at scan 4
71H	q	Horizontal line (scan 6)	Bar at scan 5
72H	r	Horizontal line (scan 9)	Bar at scan 6
73H	s	Horizontal line (scan 12)	Bar at scan 7

Table 4-14. VT52 Application Keypad Codes

Key	Application Keypad Mode
0	ESC ? p
1	ESC ? q
2	ESC ? r
3	ESC ? s
4	ESC ? t
5	ESC ? u
6	ESC ? v
7	ESC ? w
8	ESC ? x
9	ESC ? y
- (minus)	ESC ? m
, (comma)	ESC ? l
. (period)	ESC ? n
ENTER	ESC ? M
PF1	ESC P
PF2	ESC Q
PF3	ESC R
PF4	ESC S

Exit Application Keypad Mode

(Numeric Keypad Mode)

Command: ESC >

This command selects the Numeric Keypad Mode. The auxiliary keypad generates characters that correspond to the numeric, comma, period, and minus sign keys on the alphanumeric keyboard.

Table 4-15 lists Numeric Keypad Codes for VT52 Mode.

Table 4-15. VT52 Numeric Keypad Codes

Key	Numeric Keypad Mode
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
-	-
,	,
.	.
ENTER	CR or CRLF (depends on Linefeed/Newline Mode)
PF1	ESC P
PF2	ESC Q
PF3	ESC R
PF4	ESC S

Auto Print On

Command: ESC Λ

Turns on the Auto Print Mode. A line from the screen prints when the cursor moves off the line. A linefeed, form feed, or vertical tab moves the cursor off the line. The character is also transmitted to the printer.

The line is also printed during an auto wrap, and the line ends with carriage return, linefeed.

Auto Print Off

Command: ESC —

Turns off the Auto Print Mode.

Printer Controller Mode On

Command: ESC W

Turns on the Printer Controller Mode. All characters received by the terminal are printed by the serial printer, but not displayed. The terminal does not insert or delete spaces, provide line delimiters, or select the correct character sets in the printer.

Printer Controller Mode Off Command: ESC X

Turns off the Printer Controller Mode.

Print Cursor Line Command: ESC]

Causes the printer to print the line with the cursor. The cursor position does not change. Print cursor line ends when the line is printed.

Print Screen Command: ESC V

Causes the printer to print the screen. Depending on Printer Extent Mode, the complete screen prints or just the scrolling region. Print screen ends when the screen is printed.

Identify Command: ESC Z

Causes the terminal to send an identify sequence to the host computer.

Response: ESC / Z (From QVT-103 to Host - means VT52 mode)

COMMUNICATIONS

INTRODUCTION

This section describes how the QVT-103 video terminal communicates with a computer and optional serial printer. This section describes modem use and interface requirements, terminal communication features, communication protocols, and printer connections. In addition, a detailed description of pin connections and their usage is provided.

TERMINAL INTERFACE

The terminal is equipped with two serial interfaces. The first is the main port which is sometimes referred to as the EIA port or system port. This interface is a DB-25 male connector mounted on the rear panel of the terminal (see Figure 2-2) which meets Electronic Industry Association (EIA) standards RS232-C DTE and International Telegraph and Telephone Consultive Committee (CCITT) V.24 and V.28 recommendations. In addition, the port provides circuitry for an optional 20 mA current loop (passive or active) implementation (in which case the data pins do not meet the EIA standard).

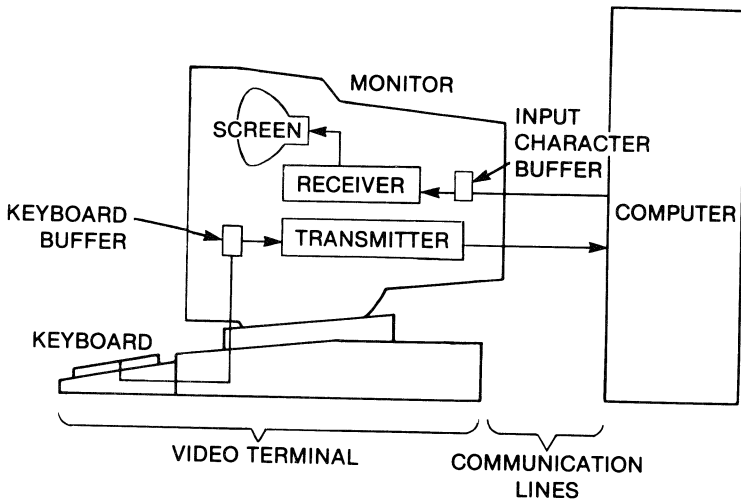
The second interface is an auxiliary (AUX) port which is used for connection to a serial printer. This port is also a DB-25 male connector (see Figure 2- 2) and conforms with EIA RS232-C DCE and ISO Standard 2110 - 1980 CE. Conformance with CITT V.24 and V.28 is also provided. This port operates in full-duplex with no modem control. XON/XOFF is used to prevent input buffer overflow.

TERMINAL DATA HANDLING

When the QVT-103 video terminal is connected to the host computer it can serve as both input and output device for the host. This is known as On-Line Mode. Figure 5-1 is a general block diagram of the terminal when it is On-Line.

The terminal can operate in one of two On-Line Modes: Local-Echo or No-Echo Modes. In Local Echo Mode, all characters transmitted to the computer are also displayed at the terminal. In this case, the echo is not dependent on the computer echoing the characters back to the terminal display. In No-Echo Mode, the terminal does not display characters on the screen as they are transmitted to the computer. In this case, the echo is dependent on the computer sending characters back to the terminal for display.

In serving as both input and output device, the terminal must reconcile transmission speed differences. If the computer sends data faster than the terminal can process it or if the operator types characters faster than the terminal can process them then a mechanism must exist to eliminate the possibility of losing data. This is solved by the use of character buffers. A buffer is a means end of temporarily storing data when it is being transmitted from one device to another. The QVT-103 uses two such buffers: an input buffer and a keyboard transmit buffer. These are discussed below:



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Figure 5-1. On-Line General Block Diagram

INPUT BUFFER

When the terminal receives a character (other than a NULL character), it places the character in a 256-character input buffer. This buffer holds the received character until it can be processed by the terminal. Characters in the buffer are processed by the terminal on a first-come first-served basis. If the input buffer receives characters faster than they can be processed, a buffer overflow condition may result. This means that the input buffer has filled and

can not store additional characters that were transmitted to it. When a data overflow condition occurs the terminal will insert a substitute character (SUB 1AH -checkerboard character) into the input buffer at the point where data was lost. This substitute character represents an unknown number of lost characters. There are three methods of preventing input buffer overflows:

1. XON/OFF characters;
2. Fill characters; and
3. Low speed operation.

XON/XOFF Characters

XON and XOFF control characters provide a simple method of starting and stopping transmission from either the terminal or host computer. When, for example as the buffer fills up, there is a need for the terminal to stop transmission from the host computer, an XOFF character (DC3 - 13H) is transmitted by the terminal. When it is again ready for transmission to resume the terminal sends an XON character (DC1 - 11H) to the computer.

The XON and XOFF control characters can be generated automatically when the Auto XON/XOFF feature in Setup is activated (see Set 5 of the Status Line in the OPERATION Section). When this feature is selected, the terminal, in most cases, can prevent buffer overflow. When the terminal's 256-character buffer holds 32 characters, the terminal will issue an XOFF character to the computer. The computer should stop transmitting characters when it receives this control character. If the input buffer continues to fill to 112 characters and the computer fails to respond to the XOFF character, a second XOFF character will be transmitted to the computer. This is a last attempt by the terminal to prevent the overflow condition. If the input buffer fills up, the terminal will ignore incoming characters, place the substitution character in the last character location in the buffer, and process the characters in the input buffer. When the input buffer has only 16 characters remaining, the terminal automatically transmits an XON character to the computer to request that transmission be resumed.

Use the following formula to determine how fast the computer must respond to the first XOFF character to avoid an input buffer overflow.

Number of characters to overflow = unused buffer space - [3 times (receive speed/transmit speed)] where unused buffer space equals 224 i.e. buffer size (256) minus number of characters in buffer needed to send first Auto XOFF (32).

Time to respond to XOFF in seconds = Number of characters to overflow times (bits per character + parity bit + number of stop bits + 1)/receiver speed.

Example - The terminal is transmitting seven-bit characters with parity and one stop bit at 2400 baud, and receiving at 4800 baud. The terminal transmits the first XOFF and the computer must stop transmitting within 0.44 seconds or the input buffer will overflow.

$$\begin{aligned} \text{Number of characters to overflow} &= 224 - (3 \times (4800/1200)) \\ &= 212 \text{ characters} \end{aligned}$$

$$\begin{aligned} \text{Time to respond to XOFF} &= (212 \times (7 \text{ bits/char} + 1 \text{ parity bit} + 1 \text{ start} \\ &\quad \text{bit} + 1 \text{ stop bit})/4800) \\ &= 0.44 \text{ seconds} \end{aligned}$$

Fill Characters

The computer can use fill characters (NULL, 00H is recommended) to prevent input buffer overflows. Since the fill character is ignored when it is received by the terminal, the terminal can process characters that are already in the input buffer while it discards the fill characters.

Fill characters are transmitted by the computer after each control function or display function. The number of fill characters needed depends on the control function transmitted and the terminal's receive speed. Table 5-1 lists the number of fill characters used when the computer transmits to the terminal.

Table 5-1. Fill Characters

Baud Rate	IND, LF, NEL, RI (smooth scroll)	DECOLM	DECALN	ED (132 col)	ED (80 col)	IND, LF, NEL, RI (jump scroll)	EL (132 col)	EL (80 col)	DECINLM	All others except RIS & DECTST
19200	324	191	190	144	104	32	6	4	7	2
9600	162	96	95	72	52	16	3	2	3	1
4800	81	48	48	36	26	8	1	1	2	0
3600	61	36	36	27	20	6	1	1	1	0
2400	41	24	24	18	13	4	1	1	1	0
2000	34	20	20	15	11	3	1	0	1	0
1800	30	18	18	14	10	3	1	0	1	0
1200	20	12	12	9	7	2	0	0	0	0
600	10	6	6	5	3	1	0	0	0	0
300	5	3	3	2	1	0	0	0	0	0
150	3	2	2	1	0	0	0	0	0	0
134.5	2	1	1	1	1	0	0	0	0	0
110	2	1	1	1	1	0	0	0	0	0
75	1	0	1	1	0	0	0	0	0	0
50	1	0	0	0	0	0	0	0	0	0

Low Speed Operation

Use of a slow receive speed by the terminal is another way to prevent input buffer overflows. Low speed operation allows the terminal to process a received character before it receives the next character. As a result, the buffer never has a chance to accumulate unprocessed characters. Use the following rules during low speed operation:

1. Never allow the computer to send the ESC code to the terminal;
2. Set the terminal receive speed to 4800 baud or less; and
3. Immediately after sending the reset or invoke confidence test, delay at least 10 seconds to allow the terminal to complete the function. This does not guarantee against character loss when a test error is detected.

KEYBOARD BUFFER

The keyboard buffer holds characters generated by the terminal before they are transmitted to the computer or processed by the terminal. If the Auto XON/XOFF feature is used in full-duplex, the computer can use the XON and XOFF control characters to control the character transmission from the terminal.

When the terminal receives an XOFF character, it stops transmitting any characters except XON or XOFF. Keystrokes are stored in the keyboard buffer which has a 9 character capacity. If the keyboard buffer overflows, the KEYBOARD LOCKED indicator on the Status Line will be turned on and keyclicks stop (if the keyclick Setup feature is on).

When the terminal receives an XON character, transmission continues. In addition, when Setup is entered the keyboard will unlock. When the keyboard buffer is empty, the KEYBOARD LOCKED indicator in the Status Line is turned off and keyclicks occur when keys are pressed (if the keyclick Setup feature is on).

COMMUNICATION MODES

MODEMS

A terminal connects to a computer directly or through a common carrier (telephone line). When connected via a telephone line, the digital signals from the transmitting device (computer or terminal) are generally transformed (modulated) into analog signals for transmission over the telephone lines and are transformed (demodulated) back into digital signals for the receiving device (computer or terminal). This MODulation/DEModulation is accomplished by using a pair of modems, one at each end of the transmission line. Several types of modems can be used with the QVT-103 video terminal but must be compatible with the type of modem used at the other end of the line. See "Modem Connections" later in this section for a list of acceptable modems that can be used with the QVT-103 terminal.

MODEM SERIAL CHARACTERS

The QVT-103 video terminal communicates serially, that is, it transmits and receives the bits that are assigned to each character one bit at a time over a single wire. The data is transmitted asynchronously (that is, there is no clock information to synchronize the sender and receiver) so extra information must be transmitted

with each character. Each transmitted character consists of: a start bit, seven or eight data bits for the actual character, an optional parity bit for error checking, and one or two stop bits for proper timing. Figure 5-2 shows the format for serial characters. The selection of data bits per character and parity type is made via the Setup function (see Set 4 of the Status Line for the auxiliary port and Set 5 for the main port).

If eight-bit characters are selected, the last data bit is ignored and is forced to the space condition (0). Data bits are transmitted with the least significant bit first (labelled LSB in Figure 5-2).

Character transmission errors for both transmitted and received characters are detected using the parity bit. Parity can be set to mark, space, odd, even, or none for seven-bit characters, and odd, even, or none for eight-bit characters. If parity is not selected, the terminal does not generate and cannot check the parity bit.

Parity checking can be disabled or enabled via a Setup feature (see Set 5 of the Status Line). If this feature is set to check parity, the terminal checks the received character's parity bit according to the parity feature that was selected. The terminal can only check for odd or even parity. If a receive parity error occurs, the terminal displays the substitution character (SUB 1AH) in place of the character in error. When the parity checking is disabled, the terminal ignores all parity bits.

The number of stop bits used on the main port and printer port are also selected via the Setup function. One or two stop bits can be selected (see Set 5 of the Status Line for main port stop bit selection and see SPEED in Set 4 of the Status Line for printer interface stop bit selection).

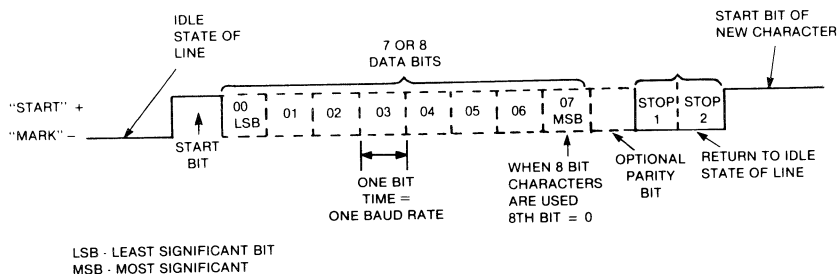


Figure 5-2. Serial Character Format

BREAK

A method by which communication can be halted either temporarily or permanently is through the use of a Break signal. This signal is a space condition that the terminal generates and sends over the communication line for 0.275 seconds + 10 percent. The Break signal can be disabled or enabled via the Setup function (see Set 3 of the Status Line). The response of the remote computer or modem to the break signal depends upon the computer, its software or the modem.

When the terminal is in half-duplex without modem control (HDX A), the terminal performs a break by turning off secondary request to send (SRTS) for 0.275 seconds + 10 percent (see "Modem Control" in this section for a discussion of HDX A and see "Signal Descriptions" in this section for a discussion of pin connections).

The Break key when used with the Shift key produces a long break disconnect that causes the terminal to turn off the data terminal ready (DTR) and request to send (RTS) signals. The transmit data line (TXD) is held in a mark condition. After 0.22 seconds, the terminal tests the condition of Data Set Ready (DSR). When data set ready is turned off or after 1.8 seconds, the disconnect is complete. When the disconnect character enable feature is selected (see Set 6 of the Status Line), the terminal transmits the disconnect character before DTR and RTS signals are turned off. The disconnect character is selected by the turnaround/disconnect feature in Setup (see Set 6 of the Status Line).

MODEM CONTROL

Communication between the terminal and computer via a modem can occur in two ways: half-duplex and full-duplex. Half-duplex uses one communication path such that only one party can communicate at a time. The other party accepts data and eventually gains control of the line and can then transmit while the other party receives. Full-duplex allows both parties to transmit simultaneously. The selection of modem control is a Setup feature (see Set 6 of the Status Line). Three of the selections are full-duplex and two selections are half-duplex. A detailed description of each of these modem control methods is presented below. An explanation of signal descriptions for all modem connectors is presented later in this section.

Full-Duplex

Full-duplex (FDX) allows communication to take place in both directions at once. There are three modes of full-duplex operation:

1. FDX A: Full-duplex without modem control (“data leads only” or “null modem” mode) with or without XON/XOFF.
2. FDX B: Full-duplex with full modem control with or without XON/XOFF.
3. FDX C: Asymmetric full-duplex with full modem control and reverse channel; secondary channel, with or without XON/XOFF.

Full-Duplex without Modem Control (FDX A). FDX A (data leads only) allows the terminal to communicate with the computer regardless of the received modem control signals. The terminal assumes it is connected to the computer. Transmission and reception are enabled as long as the terminal is On-Line.

FDX A Connection. Communication can occur regardless of the state of other modem control lines. DTR is on at all times except when the terminal is Off-Line, or performing a long break disconnect. RTS is ON at all times except when the terminal goes On-Line, at which time it is turned OFF for 250 ms and is then turned ON. RTS is also Off during a long break.

The terminal prepares to connect to the computer after DTR turns off. The terminal prepares to communicate by performing the following steps:

1. The keyboard erases the keyboard buffer, and turns off the Keyboard Locked indicator on the Status Line (if the keyboard locked condition has occurred);
2. The terminal stops print operations and does not perform any requested print operations;
3. The terminal uses any of the 5 character sets selected by the character set Setup feature (see Set 9 of the Status Line). The terminal does not use any computer selected character sets such as the special character set; and

4. If the Auto XON/XOFF Setup feature is selected, the terminal always allows transmission in both directions by transmitting XON. If the answerback message is selected and enabled it also transmits it at the time of connection; that is, when it goes On-Line;

FDX A Disconnection. The terminal disconnects the communication line (telephone) by turning off data terminal ready (DTR). The terminal performs a disconnect when it:

- Is switched Off-Line (through the Setup mode);
- Performs a recall, reset or general default in Setup mode;
- Performs a Shift Break disconnect, in which case the terminal transmits a disconnect character if the disconnect character enable feature within Setup is on (see Set 6 of the Status Line);
- Receives a disconnect character and the disconnect character enable feature within Setup is on.

Full-Duplex with Modem Control (FDX B). FDX B (modem control) allows communication when the terminal receives the correct modem control signals. Modem control signals guarantee a connection between the terminal and the computer before and during communication. If the proper connection is not established the terminal will not allow communication; that is, transmission and reception on the communication line are only allowed if the QVT-103 is On-Line and if a communication line connection has been completely established.

FDX B Connection. The terminal will verify proper connection before it attempts to communicate. The clear to send (CTS), Data Carrier Detector (DCD), and data set ready (DSR) signals must all be ON.

When the data set ready (DSR) signal turns ON, the terminal prepares to connect to the computer as follows:

- The keyboard erases the keyboard buffer, and turns off the KEYBOARD LOCKED indicator on the Status Line (if the keyboard locked condition has occurred);

- The terminal stops print operations and does not perform any requested print operations;
- The terminal uses any of the 5 character sets selected by the character set Setup feature (See Set 9 of the Status Line). The terminal does not use any computer selected character sets such as the special character set;
- The terminal selects Numeric Keypad Mode (the numeric keypad generates numeric characters). The cursor keys transmit cursor movement commands;
- The terminal selects Replace Mode (turns off Insert Mode). The INSERT indicator is off and all received characters are displayed at the cursor position, replacing any previously displayed character;
- The terminal allows transmission in both directions (assumes XON) if the auto XON/XOFF Setup feature is selected (see Set 5 of the Status Line);
- When DCD comes on, the receiver is enabled; and
- Once DCD and CTS are ON, the answerback message and XON are transmitted (if enabled), then the transmitter is enabled.

FDX B Disconnection. The terminal disconnects the communication line (telephone) by turning off data terminal ready (DTR). A disconnect is performed when the terminal:

- Is switched Off-Line;
- Performs a recall, reset or general default in the Setup mode;
- Receives a disconnect character and the disconnect character enable feature is on (see Set 6 of the Status Line);
- Performs a Shift Break disconnect, in which case the terminal transmits a disconnect character if the disconnect character enable feature within Setup is on (see Set 6 of the Status Line);
- Loses data set ready (DRS) during communication;

- After a connection, loses the Data Carrier Detect Signal (DCD) for a longer time than is allowed by the disconnect delay Setup feature (see Set 6 of the Status Line);
- Does not get an ON state on the DCD pin within 30 seconds after data set ready (DSR) is turned on.

Asymmetric Full-Duplex (FDX C). Asymmetric full-duplex is full-duplex communication using a half-duplex modem with a secondary channel. The secondary channel on the modem must be able to operate at 50 baud or greater. The primary channel typically operates at 1200 baud or greater. The QVT-103 terminal transmits data on the secondary channel and the host computer transmits data on the primary channel. To operate the modem in asymmetric full-duplex, the signals for the secondary channel need to be enabled using option switches located inside the terminal. See appendix A for switch placements. In order to properly set these switches, the operator should consult the manual of the modem that is used. A typical configuration requires switches 1, 2, 5, and 6 to be open, and switches 3, 4, 7, and 8 to be closed. Note that in asymmetric full-duplex mode, RTS is always held low, which disables the primary channel in most modems that have a secondary channel. If such a modem is used, it is practical to leave switches 1, 2, and 6 closed so that other true full-duplex modems can be used without having to change the switch settings. However, the operator must be certain that having the other switches closed will not damage true full-duplex modems. Of course, when a full-duplex modem is used, the operator should select FDX A or B operation

FDX C Connection. The terminal will verify proper connection before it attempts to communicate. The secondary clear to send (SCTS), Data Carrier Detect (DCD), and data set ready (DSR) signals must all be ON. When the data set ready (DSR) signal turns on, the terminal prepares to connect to the computer as follows:

- The keyboard erases the keyboard buffer, and turns off the KEYBOARD LOCKED indicator on the Status Line (if the keyboard locked condition has occurred);
- The terminal stops print operations and does not perform any requested print operations;

- The terminal uses any of the 5 character sets selected by the character set Setup feature (See Set 9 of the Status Line). The terminal does not use any computer selected character sets such as special characters;
- The terminal selects Numeric Keypad Mode (the numeric keypad generates numeric characters). The cursor keys transmit cursor movement commands;
- The terminal selects Replace Mode (turns off Insert Mode). The INSERT indicator is off and all received characters are displayed at the cursor position, replacing any previously displayed character; and
- The terminal allows transmission in both directions (assumes XON) if the auto XON/XOFF Setup feature is selected (see Set 5 of the Status Line).

FDX C Disconnection. The terminal disconnects the communication line (telephone) by turning off data terminal ready (DTR). A disconnect is performed when the terminal:

- Is switched Off-Line;
- Performs a recall, reset or general default in the Setup mode;
- Performs a Shift Break disconnect, in which case the disconnect character enable feature within Setup is on (see Set 6 of the Status Line);
- Loses data set ready (DSR) during communication;
- After a connection, loses Data Carrier Detect (DCD) for a longer time than is allowed by the disconnect delay Setup feature (see Set 6 of the Status Line);
- Does not turn on DCD within 30 seconds after data set ready (DSR) is turned on.

Half-Duplex

Half-duplex (HDX) allows characters to be transmitted and received in both directions but only one direction at a time. Because half-duplex allows communication in only one direction at a time, it is necessary to control the direction of the communication line. The

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direction of the line determines if the terminal receives or transmits characters. Every time the transmitting device is to receive, the line is turned around. The terminal uses either:

1. HDX A: Half-duplex with Supervisory Control Mode and reverse channel.
2. HDX B: Half-duplex with coded control and no reverse channel.

Half-Duplex with Supervisory Control (HDX A). Half-duplex with supervisory control allows the computer to control line turnarounds. The computer uses the secondary channel control signals to control line turnarounds. The computer does not use the secondary channel to transfer data. In this case, modems that operate at 5 baud on the secondary channel can be used.

HDX A Connection. Before the terminal attempts to communicate, it verifies connection to the computer by using data set ready (DSR). The terminal prepares to connect to the host computer only when the DSR signal is ON. The terminal prepares to connect to the computer as follows:

- The keyboard erases the keyboard buffer, and turns off the KEYBOARD LOCKED indicator on the Status Line (if the keyboard locked condition has occurred);
- The terminal stops print operations and does not perform any requested print operations;
- The terminal uses any of the 5 character sets selected by the character set Setup feature (see Set 9 of the Status Line). The terminal does not use any computer selected character sets such as the special character set;
- The terminal selects Numeric Keypad Mode (the numeric keypad generates numeric characters). The cursor keys transmit cursor movement commands;
- The terminal selects Replace Mode (turns off Insert Mode). The INSERT indicator is off and all received characters are displayed at the cursor position, replacing any previously displayed character; and

- The terminal determines the initial direction of transmission by using the initial direction Setup feature (see Set 6 of the Status Line);

HDX A Disconnection. The terminal disconnects the communication line (telephone) by turning off data terminal ready (DTR). A disconnect is performed when the terminal:

- Is switched Off-Line;
- Performs a recall, reset or general default in the Setup mode;
- Performs a Shift Break disconnect, in which case the terminal transmits a disconnect character if the disconnect character enable feature within Setup is on (see Set 6 of the Status Line);
- Loses data set ready (DSR) during communication;
- Does not complete a line turnaround within 5 seconds.

HDX A Character Transmission and Reception. When the host computer desires to transmit, it drops SRTS, which causes the QVT-103's secondary data carrier detect (SDCD) to turn OFF. When the QVT-103 sees SDCCD turn OFF, it drops RTS and waits for DCD to turn ON, indicating the host computer is transmitting. Then it turns SRTS ON and goes into the receive state.

When the host computer desires to receive, it drops RTS, and turns SRTS ON, causes the QVT-103 to see DCD OFF, and SDCCD goes ON. The QVT-103 then goes into the transmit state.

Half-Duplex with Code Control (HDX B). Half-duplex with code control allows the transmitting device to control line turnarounds with a control character. The transmitting device controls line turnarounds by transmitting a turnaround character specified by the turnaround/disconnect Setup feature (see Set 6 of the Status Line). Line turnarounds are performed using modem control lines. HDX B allows the transmitting device to control line turnaround, using specific control characters.

- A single turnaround character is provided by the Setup parameter (see Set 6 of the Status Line). The following are valid turnaround characters for the QVT-103:

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1. Form Feed	FF (0CH)
2. End of Text	ETX (03H)
3. End of Transmission	EOT (04H)
4. Carriage Return	CR (0DH)
5. Device Control 3	DC3 (13H)

HDX B Connection. Before the terminal attempts to communicate, it verifies connection to the computer by using data set ready (DSR). The terminal prepares to connect to the computer when DSR turns ON. The terminal does the following in preparation for communication:

- The keyboard erases the keyboard buffer, and turns off the KEYBOARD LOCKED indicator on the Status Line (if the keyboard locked condition has occurred);
- The terminal stops print operations and does not perform any requested print operations;
- The terminal uses any of the 5 character sets selected by the character set Setup feature (see Set 9 of the Status Line). The terminal does not use any computer selected character sets such as the special character set;
- The terminal selects Numeric Keypad Mode (the numeric keypad generates numeric characters). The cursor keys transmit cursor movement commands;
- The terminal selects Replace Mode (turns off Insert Mode). The INSERT indicator is off and all received characters are displayed at the cursor position, replacing any previously displayed character; and
- The terminal determines the initial direction of transmission by using the initial direction Setup feature (see Set 6 of the Status Line).

HDX B Disconnection. The terminal disconnects the communication line (telephone) by turning off data terminal ready (DTR). A disconnect is performed when the terminal:

- Is switched Off-Line;
- Performs a recall, reset or general default in Setup mode;
- Performs a Shift Break disconnect. The disconnect character enable feature within Setup is on (see Set 6 of the Status Line);
- Loses data set ready (DSR) during communication;
- Loses DCD for more than 5 seconds without receiving a turnaround character;
- Does not complete a line turnaround within 5 seconds.

HDX B Character Transmission and Reception. When the host computer desires to transmit, it turns ON RTS, which causes the QVT-103's receive line signal detector (RLSD) to turn ON. When the QVT-103 sees RLSD turn ON, it drops RTS and CTS to the terminal is OFF. The terminal receives characters from the terminal.

When the QVT-103 desires to transmit, it turns ON RTS, and RLSD turns ON at the computer. CTS turns ON at the QVT-103 and the QVT-103 then goes into the transmit state.

MODEM CONNECTIONS

The following list summarizes the possible modem control and modem configurations for each communication mode:

Table 5-2. Modem Configuration Summary

Modem Control	Modem	Baud Rate	Wire Connection
FDX A	<ol style="list-style-type: none"> 1. BELL 103 2. BELL 113 3. BELL 212A 4. DF01-A 5. DF02 6. DF03 	<ol style="list-style-type: none"> 300 baud 300 baud 1200 baud 300 baud 300 baud 300/1200 baud 	<ol style="list-style-type: none"> 2-wire 2-wire 2-wire 2-wire 2-wire 2-wire
FDX B	<ol style="list-style-type: none"> 1. BELL 103 2. BELL 113 3. BELL 212A 4. Datel1200 V.21 5. Datel 600 V.23 6. D200/D300S 7. D1200SDX V.22 8. DFG300 V.24 9. DAG1200M V.23 10. DF02 11. DF03 	<ol style="list-style-type: none"> 300 baud 300 baud 1200 baud 200/300 baud 1200 baud 200/300 baud 1200 baud 300 baud 1200 baud 300 baud 300/1200 baud 	<ol style="list-style-type: none"> 2-wire 2-wire 2-wire 2-wire 4-wire 2-wire 2-wire 2-wire 4-wire 2-wire 2-wire
FDX C	<ol style="list-style-type: none"> 1. D1200S 2. Datel 600 	<ol style="list-style-type: none"> 1200 baud (REC) 75 baud (TX) 600/1200 baud (REC) 75 baud (TX) 	<ol style="list-style-type: none"> 2-wire 2-wire
HDX A	<ol style="list-style-type: none"> 1. BELL 202 2. D1200S V.23 	<ol style="list-style-type: none"> 1200 baud 1200 baud 	<ol style="list-style-type: none"> 2-wire 2-wire
HDX B	<ol style="list-style-type: none"> 2. D1200S V.23 	<ol style="list-style-type: none"> 1200 baud 	<ol style="list-style-type: none"> 2-wire

SIGNAL DESCRIPTIONS

The pin connections used for communication are described below:

NOTE 1: Negative voltage = 1 = Mark = OFF
Positive voltage = 0 = Space = ON

NOTE 2: The QVT-103 complies with functionality specified in EIA RS232-C and CCITT Recommendation V.24.

1. Protective Ground (PGND Pin 1)
 - A. This conductor is connected to the QVT-103 chassis.
 - B. Use of protective ground as a reference voltage is not allowed.
2. Transmitted Data (TXD Pin 2), Output.
 - A. Signals on the circuit represent the serially encoded characters that are transmitted from the QVT-103.
 - B. This circuit is held in the MARK state during intervals between characters and at all times when no data is being transmitted.
 - C. In FDX B and FDX C, the QVT-103 will not transmit data unless an ON condition is present on all of the following four circuits:
 1. Request To Send (Pin 4)
 2. Clear To Send (Pin 5)
 3. Data Set Ready (Pin 6)
 4. Data Terminal Ready (Pin 20)

In FDX A (data leads only) Mode, data is transmitted regardless of the state of these control lines.

In FDX C data is transmitted in pin 14.

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3. Receive Data (RXD Pin 3), Input.

Signals on this circuit represent the serially encoded characters to be received by the QVT-103.

When in FDX B and FDX C Modes, the received characters are ignored if DCD is OFF.

When in FDX A Mode, received data is processed regardless of the control lines.

4. Request To Send (RTS Pin 4), Output.

A. In FDX Mode, the ON condition maintains the QVT-103 in the transmit mode. The OFF condition maintains the QVT-103 in the non-transmit mode.

When OFF LINE, RTS is OFF.

B. In HDX Mode, the ON condition maintains the terminal in the transmit mode. The OFF condition maintains the terminal in the receive mode.

5. Clear To Send (CTS Pin 5), Input.

An ON condition of CTS indicates that the modem is ready to transmit. If CTS is OFF, the modem is not prepared to transmit. This pin goes into a true state when unterminated.

6. Data Set Ready (DSR Pin 6), Input.

The ON condition of DSR indicates that the modem is in data mode and is connected to a communications channel. This pin goes into a true state when unterminated.

When DSR goes to an OFF condition during the process of a call but before DTR is turned OFF, the terminal interprets this condition as a lost or aborted call and disconnects.

In all modem modes except FDX A (data leads only), data must not be received or transmitted until 50/0/ ms after DSR goes ON.

In all modes except FDX-A, if the modem or host computer goes into an undefined (invalid) state with DSR on for a period greater than 30 seconds, the terminal will try to reset this device by pulsing DTR and RTS (or SRTS, as required) for two seconds every 30 seconds until a defined (valid) state is obtained. The terminal will then go into its initial on-line state.

7. Signal Ground (SGND Pin 7)

This circuit establishes the common ground reference potential for all interface circuits except protective ground.

8. Data Carrier Detect (DCD Pin 8), Input.

DCD is ON when the received signal is of sufficient quality and magnitude to ensure proper demodulation of received data. This pin goes into a true state when unterminated.

DCD is OFF when the received signal is not powerful enough to transfer data; data received is ignored.

9. Secondary Request To Send (SRTS Pin 11), Output

SRTS turns on the transmitter (when enabled) of the secondary channel in the modem. It is also used for the FDX C and HDX A modes. The response from the modem to SRTS is SCTS which is needed in FDX C. In HDX A, only the SRTS and SCD are used.

10. Speed Indicator/Secondary Data Carrier Detect (SI/SDCD Pin 12), Input.

Pin 12 has two meanings. In FDX B it takes the meaning SI. In HDX A it takes the meaning of SDCD. SDCD indicates that a valid signal is being received by the secondary channel receiver in the modem.

SI allows the BELL 212A modem or an equivalent to control the QVT-103 terminals' transmit and receive baud rates.

When SI is ON, transmit and receive speeds are 1200 baud regardless of main port transmit and receive speed.

When SI is OFF, transmit and receive speeds are main port transmit and receive speed.

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11. Secondary Clear To Send (SCTS Pin 13), Input.

An ON condition indicates that the modem is ready to transmit data. When OFF, the modem is not ready to transmit data. This pin goes into a true state when unterminated.

12. Secondary Transmit Data (STXD Pin 14), Output

Secondary transmit data signal provides the necessary functionality in FDX C (asymmetric FDX Mode).

The functionality provided is the same as the primary transmit data (Pin 2) in FDX Mode; however, it occurs on the secondary transmit data pin (Pin 14).

13. Secondary Request To Send (SRTS Pin 19), Output

SRTS turns on the transmitter (when enabled) of the secondary channel in the modem. It is also used for the FDX C and HDX A modes. The response from the modem to SRTS is SCTS which is needed in FDX C. In HDX A, only the SRTS and SRLSD are used.

14. Data Terminal Ready (DTR Pin 20), Output

The QVT-103 puts DTR to On state whenever it is ready to transmit or receive.

DTR in the ON state allows the modem to be connected to the communications line and maintains the connection. DTR in the OFF state prevents the modem from completing a call that is started and causes an already established call to disconnect.

DTR is in ON state when terminal is On-Line and in OFF state when the terminal is Off-Line.

15. Ring Indicator (RI Pin 22), Input

This pin has a receiver but is ignored at all times.

16. Speed Select (SS Pin 23), Output

SS allows the QVT-103 to control the modulation method of the modem to coincide with the operator selected baud rate of the QVT-103. If the operator selected receive baud rate in the QVT-103 is 60/0/ baud or less, the SPSP output from the QVT-103 will be OFF. If the operator selected baud rate is greater than 600, SPSP will be ON.

CONNECTING TO THE PRINTER

The terminal connects to a local serial printer by using a printer interface. The printer interface is full-duplex and uses the XON and XOFF characters to prevent printer input buffer overflow. Recommended serial printers are listed below.

- | | |
|-------------------|----------------------|
| 1. Qume SPRINT 5 | Model 45
Model 55 |
| 2. Qume SPRINT 11 | Model 45
Model 55 |

SERIAL PRINTER INTERFACE

The serial printer interface on the QVT-103 is a DB-25 (EIA RS232-C type) male connector mounted on the back of the terminal (Figure 2-2). The interface meets Electronic Industry Association (EIA) standard RS423, RS232-C and International Telegraph and Telephone Consultive Committee (CCITT) recommendation V.28. The pin assignments are listed in Appendix A.

The printer interface uses full-duplex communications with XON/XOFF buffer control to prevent buffer overflows. If possible, the printer should turn off Data Terminal Ready (DTR) when the printer is not ready to print. DTR has a higher priority than XON/XOFF. The terminal will not transmit to the printer when the terminal receives an XON, if DTR is off. Also, if DTR is on, the terminal assumes XON.

GLOSSARY

INTRODUCTION

This glossary of terms is provided as an aid to acquiring a better understanding of the terminal and its environment.

ASCII

Acronym for the American Standard Code for Information Interchange. A standardized code for the transmission of data, composed of 128 characters (upper- and lower-case letters, numbers, punctuation marks, symbols, and control characters) represented in 7-bit binary format. In this manual, the Appendix contains the equivalent French, German, and Spanish codes.

BAUD RATE

The rate of data transmission. One baud represents a transmission rate of one binary bit of data per second.

BREAK

A communications interrupt signal used to immediately halt communications.

COMMAND

A special code, or sequence of codes, that causes the terminal or host computer to perform a specific electronic or mechanical action. Commands can be generated from the keyboard by using the Control or Escape keys.

CONTROL CHARACTER

A character whose occurrence in a particular context initiates, modifies, or stops a control function.

CONTROL FUNCTION

Refers to various actions that affect the recording, processing, transmission or interpretation of data, for example, starting or stopping a process, carriage return, font change, and end of transmission.

CURSOR

A highlighted area (underline or block) that is used on the display screen to indicate the next character position.

DATA

A general term used to describe that which is transmitted. Data is both encoded alphanumeric characters and command instructions.

DEL (DELETE)

An ASCII code used to delete or cancel transmitted data.

DELIMITER

Refers to a character that limits a string of characters and, therefore, cannot be a member of the string.

EDIT MODE

A terminal mode where all characters are displayed as they are entered but are not transmitted to the computer until requested by the computer or the terminal keyboard (see interactive mode).

EIA RS232-C

The Electronic Industries Association that sets forth standards for electronic and electrical devices. Your terminal complies with the EIA RS-232-C Standard for communicating devices.

EMULATION

The act of imitating a device as if it were that device. The QVT-103 emulates the Digital Equipment VT52, VT131, and VT100 video terminals in addition to having its own command set.

HANDSHAKING

A communications method that controls the flow of data transmission. This is necessary when the speed of data handling varies between the devices within the system. A choice of three handshaking methods is possible with the QVT-108: XON/XOFF (Transmit On/Transmit Off) with DTR (Data Terminal Ready), XON/XOFF only, or DTR only

HOME

Home is that position on the display screen identified as line 1, column 1

HOST OR HOST COMPUTER

The computer that controls the system of which the terminal is a part

INTERFACE (AUX AND EIA)

The communications channel through which data flows; both the physical connectors and the signal lines

INTERACTIVE MODE

A terminal mode where all keyboard entries generate characters that are placed in the keyboard character buffer and are transferred immediately to the computer

MODEM

Refers to MODulation/DEModulation chip, or device, that enables computers and terminals to communicate over telephone circuits

MONITOR MODE

Refers to the SETUP option of displaying control character sequences on the screen rather than executing them.

NORMAL VIDEO

That condition of the video screen in which data is displayed as light characters on a dark background. Normal or standard video is the opposite of reverse video

NUL (NULL)

An ASCII code that is used as a fill character in some communications formats (a nothing character)

ON-LINE

Relates to equipment, devices or systems in direct communication with the central processing unit of the computer. Also describes terminal equipment connected to a transmission line.

OFF-LINE

Relates to equipment or devices not under direct control of the central processing unit of the computer. Also describes terminal equipment not connected to a transmission line

PARITY

A method of checking for errors in data communications

REVERSE VIDEO

That condition of the video screen in which data is displayed as dark characters on a light background. Reverse video is the opposite of normal or standard video

SCREEN SAVER

Refers to the ability of a terminal device to automatically turn off the video display if no input or output to the terminal has occurred within a predetermined time. The contents of the screen are not lost. The first character sent or received by the terminal restores the screen in its entirety. This feature prolongs the screen display life

SCROLL

As all 24 lines of the display screen are filled with data, the screen is said to "scroll" when the entire display moves up one line to vacate the bottom line for new data

STOP BIT

Refers to the last element of a character in a start-stop (asynchronous) serial transmission; used to ensure proper recognition of the next start element

TERMINAL

An electronic communicating device that is generally considered to have the capability to transmit and receive data. Some terminals are used as receive-only devices

TOGGLE

To select a function, or enable or disable a function, by depressing a key. In this terminal, the fields in the status lines are toggled by the space bar, or the upper- or lower-case letter "T" key

TURNAROUND

The time required for a transmission line to reverse the direction of communication flow. Sometimes this also refers to the process of reversing direction without any timing consideration. This is accomplished by the use of communication control characters transmitted either by the computer or by the terminal

WRAPAROUND

An automatic carriage return/line feed operation. The action of the cursor as it reaches the end of a line and then automatically goes to the beginning of the next line

APPENDIX

The following appendices are provided for reference.

Appendix

- A EIA/AUX Connector Pinout Descriptions
- B Error Codes Summary
- C UK/US ASCII Code Chart
- D French/US Code Chart
- E German/US Code Chart
- F Spanish/US Code Chart
- G Control Code Keystrokes
- H Command Set Summary
- I The Status Line

Appendix A. EIA/AUX Connector Pinout Descriptions

System Interface

System interface signal levels and protocol conform with EIA RS232-C DTE and also provide circuitry for 20 mA current loop (active or passive). Interface hardware needs to be a DB-25 female connector conforming to ISO standard 2110-1980(E) for 25 pin connector. Concurrent conformance with CCITT V.24 and V.28 is also required. Note that the Current Loop option requires several components to be added to the logic printed circuit board inside the terminal. When these components are added on the board, the Current Loop pins in the EIA connector no longer meet EIA standards. Due to the current capability of these circuits, the user must ensure that the four pins affected do not come in contact with the other EIA pins since doing so may damage the EIA drivers.

Connector Pin-Out

The following pins are active:

Pin #	Description	Std Abbr.	Direction	
			From/To	QVT
1	Chassis ground	FG		
2	Transmit data from terminal	TXD	X	
3	Receive data to terminal	RXD		X
4	Request to send	RTS	X	
5	Clear to send	CTS		X
6	Data set ready	DSR	X	
7	Signal ground	SG		
8	Data carrier detect	DCD		X
11	Secondary request to send	SRTS	X	
12	Speed indicator/Secondary data carrier detector	SI/SDCD		X
13	Secondary clear to send	SCTS		X
14	Secondary transmitted data	STXD	X	
19	Secondary request to send	SRTS	X	
20	Data terminal ready	DTR	X	
22	Ring Indicator	RI		X
23	Speed select	SS	X	

Additionally, the following pins have the indicated functions when the terminal is configured for the 20 mA current loop mode:

17	Current loop, - transmit	X	
21	Current loop, + receive		X
24	Current loop, - receive		X
25	Current loop, + transmit	X	

These four pins assume a high impedance state when terminal is in RS232 mode.

In most current loop applications, the QVT-103 is connected in a passive configuration- that is, current is supplied to the terminal. In this mode, the transmitter and receiver are both passive, both optically isolated, and the transmitter goes to the mark state when power is turned off.

Conversion from active to passive (or vice versa) should only be attempted by qualified personnel according to the Current Loop Interface Jumper Placement information below:

Current Loop Interface Jumper Placement *

JUMPER	ACTIVE MODE	PASSIVE MODE
W1	Out	In
W2	In	Out
W3	Out	In
W4	In	Out
W5	In	Out
W6	Out	In
W7	In	Out
W8	Out	In
W9	In	Out
W10	In	Out

* Additional Factory Installed Current Loop Components Required.

In active mode either the transmitter or the receiver or both may be connected so that the QVT-103 sources the 20 mA of current. In active mode, isolation is not present and the transmitter goes to the space state when power to the QVT-103 is turned off.

Communication Line Selection

The following lines have internal switches to connect or disconnect them from the external connector:

Pin #	Notes	Internal SW Position
4	On/Off function	1
5	5 and 13 must be in opposite configurations	2
13	13 and 5 must be in opposite configurations	3
12	On/Off function	4
11	11 and 19 must be in opposite configurations	5
2	2 and 14 must be in opposite configurations	6
14	14 and 2 must be in opposite configurations	7
19	19 and 11 must be in opposite configurations	8
22	On/Off function	9
23	On/Off function	10

EIA RS-232-C Interface Switch Positions and Functions

Internal Communication Switch *	Modem Connector	Pin No.	Name (Signal)	Designation EIA/CCITT/DIN
OFF ON				
<input type="checkbox"/> <input checked="" type="checkbox"/>	1	4	Request to Send	CA/105/S2
<input type="checkbox"/> <input checked="" type="checkbox"/>	2	5	Clear to Send	CB/106/M2
<input checked="" type="checkbox"/> <input type="checkbox"/>	3	13	Sec Clear to Send	SCB/121/HM2
<input type="checkbox"/> <input checked="" type="checkbox"/>	4	12	Speed Indicator/ Sec Data Carrier Detector	CI/112 SCF/122/HM5
<input checked="" type="checkbox"/> <input type="checkbox"/>	5	11	Sec Request to Send	SCA/120
<input type="checkbox"/> <input checked="" type="checkbox"/>	6	2	Transmitted Data	BA/103/D1
<input checked="" type="checkbox"/> <input type="checkbox"/>	7	14	Sec Transmitted Data	SBA/118/HD1
<input type="checkbox"/> <input checked="" type="checkbox"/>	8	19	Sec Request to Send	SCA/120/HS2
<input type="checkbox"/> <input checked="" type="checkbox"/>	9	22	Ring Indicator	CE/125/M3
<input checked="" type="checkbox"/> <input type="checkbox"/>	10	23	Speed Select	Ch/111/S4

* Switch shows Factory Configuration

Listed below are all EIA system and printer interface pins active under the various possible communication modes. Line mnemonics are given, as well as their functional direction (input/output). Switch settings enabling individual pins are indicated; standard (factory) active configuration is footnoted. Note that the Ring Indicator pin (pin 22 of the EIA connector) is shown in the modes in which it would be used, but even though this product has a receiver and an enabling switch for that pin, the terminal ignores it at all times.

Interface & Communications Protocol Status

EIA CONNECTOR (Host) Enabling Switches				Mode					AUX CONNECTOR (Printer)
Pin	Open	Close	I/O	FDX-A*	FDX-B*	FDX-C	HDX-A*	HDX-B*	
1			C	FG	FG	FG	FG	FG	FG
2	7*	6*	O	TXD	TXD		TXD	TXD	TXD
3			I	RXD	RXD	RXD	RXD	RXD	RXD**
4		1*	O	RTS	RTS		RTS	RTS	
5	3*	2*	I		CTS		CTS	CTS	
6			I		DSR	DSR	DSR	DSR	DSR
7			C	SG	SG	SG	SG	SG	
8			I		DCD	DCD	DCD	DCD	
9									
10									
11	8	5	O			SRTS	SRTS		
12		4*	I		SI		SDCD		
13	5	3	I			SCTS			
14	6	7	O			STXD			
15									
16									
17									
18									
19	5*	8*	O				SRTS		
20			O	DTR	DTR	DTR	DTR	DTR	DTR
21									
22		9	I		RI	RI	RI	RI	
23		10	O	SS	SS	SS	SS	SS	SS
24									
25									

Notes: Enabling Switches are on Logic PCB; contact your service representative for information regarding switch reconfiguration.

I/O mnemonics are: O - for output;
I - for input;
C - for common.

* - standard active configuration.
** - XON/XOFF only.

Printer Port Interface

Printer port interface signal levels and protocol conform with EIA RS232-C DCE. Interface hardware is a DB-25 female connector conforming to ISO standard 2110-1980(E) for 25 pin connectors. Concurrent conformance with CCITT V.24 and V.28 is required.

Connector Pin-Out

The following pins are active:

Pin #	Description	Std. Abbr.	Direction	
			From	To QVT
1	Chassis ground	FG		
2	Transmit data	TXD	X	
3	Receive data	RXD		X
6	Data set ready	DSR		X
7	Signal ground	SG		
20	Data terminal ready	DTR	X	

Appendix B. Error Codes Summary

When the terminal is powered On, a self-test is automatically performed. If a non-fatal error is detected, an error code will be displayed on the screen. For example, if the number "1" is displayed, this signifies that an error exists in the video RAM circuit.

CHARACTER	FAULT DETECTED ITEM					
	POWERUP SELF TEST			DATA	EIA	PRINTER
	Video RAM	NVR	KBD	Loopback	Loopback	Loopback
1	*					
2		*				
3	*	*				
4			*			
5	*		*			
6		*	*			
7	*	*	*			
8				*		
@					*	
P						*

Legend: NVR = Non-Volatile Memory = one 5516 IC.
 Video RAM = Four 6116 ICs (2 page) or Eight 6116 ICs (4 page)
 KBD = Keyboard.

Appendix C. UK/US ASCII Code Chart

Bits					Column																							
b7	b6	b5	b4	b3	b2	b1	Row	0	1	2	3	4	5	6	7													
0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	1	0	1	0	1	1							
0	0	0	0	0	0	0	0	0	1	2	3	4	5	6	7													
0	0	0	0	0	0	0	0	0	NUL	DLE	SP	0	@	P	'	p												
0	0	0	0	0	1	1	1	1	SOH	DC1	!	1	A	Q	a	q												
0	0	0	1	0	2	2	2	2	STX	DC2	"	2	B	R	b	r												
0	0	1	1	3	3	3	3	3	ETX	DC3	#	3	C	S	c	s												
0	1	0	0	4	4	4	4	4	EOT	DC4	\$	4	D	T	d	t												
0	1	0	1	5	5	5	5	5	ENQ	NAK	%	5	E	U	e	u												
0	1	1	0	6	6	6	6	6	ACK	SYN	&	6	F	V	f	v												
0	1	1	1	7	7	7	7	7	BEL	ETB	'	7	G	W	g	w												
1	0	0	0	8	8	8	8	8	BS	CAN	(	8	H	X	h	x											
1	0	0	1	9	9	9	9	9	HT	EM	)	9	I	Y	i	y											
1	0	1	0	A	A	A	A	A	LF	SUB	*		J	Z	j	z												
1	0	1	1	B	B	B	B	B	VT	ESC	+	.	K	[	k	{											
1	1	0	0	C	C	C	C	C	FF	FS	.	<	L	\	l													
1	1	0	1	D	D	D	D	D	CR	GS	-	=	M]	m	}												
1	1	1	0	E	E	E	E	E	SO	RS		>	N	^	n	~												
1	1	1	1	F	F	F	F	F	SI	US	/	?	O	_	o	DEL												

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32 ASCII CONTROL CODES 96 ASCII CHARACTER SET

Notes: Hexadecimal = ASCII Column + Row. E.g. A = 41 Hex

ASCII Encoded Letter A = Bits: P 7 6 5 4 3 2 1

* 1 0 0 0 0 0 1

(* = parity bit)

The United Kingdom pound sign character is located at 32H, the “#” sign of the US character set.

Appendix D. French/US Code Chart

Bits					Column	0	0	0	0	1	1	1	1	1
b7	b6	b5	b4	b3	b2	b1	0	0	0	0	1	1	1	1
					Row	0	1	2	3	4	5	6	7	
0	0	0	0	0	0	0	NUL	DLE	SP	0	à/@	P	'	p
0	0	0	0	1	1	1	SOH	DC1	!	1	A	Q	a	q
0	0	1	0	0	2	2	STX	DC2	"	2	B	R	b	r
0	0	1	1	0	3	3	ETX	DC3	£/#	3	C	S	c	s
0	1	0	0	0	4	4	EOT	DC4	\$	4	D	T	d	t
0	1	0	1	0	5	5	ENQ	NAK	%	5	E	U	e	u
0	1	1	0	0	6	6	ACK	SYN	&	6	F	V	f	v
0	1	1	1	0	7	7	BEL	ETB	'	7	G	W	g	w
1	0	0	0	0	8	8	BS	CAN	(	8	H	X	h	x
1	0	0	1	0	9	9	HT	EM	)	9	I	Y	i	y
1	0	1	0	0	A	A	LF	SUB	*		J	Z	j	z
1	0	1	1	0	B	B	VT	ESC	+	.	K	°/[	k	é/l
1	1	0	0	0	C	C	FF	FS	.	<	L	ç/\	l	u/l
1	1	0	1	0	D	D	CR	GS	-	=	M	§/]	m	è/i
1	1	1	0	0	E	E	SO	RS		>	N	^	n	/~
1	1	1	1	0	F	F	SI	US	/	?	O	_	o	DEL

HEXADECIMAL = COLUMN + ROW

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Appendix E. German/US Code Chart

Bits					Column	0	1	2	3	4	5	6	7	
b7	b6	b5	b4	b3	b2	b1	0	1	2	3	4	5	6	7
Row					0	1	2	3	4	5	6	7		
0	0	0	0	0	0	0	NUL	DLE	SP	0	§/@	P	'	p
0	0	0	0	1	1	1	SOH	DC1	'	1	A	Q	a	q
0	0	1	0	0	2	2	STX	DC2	"	2	B	R	b	r
0	0	1	1	1	3	3	ETX	DC3	#/#	3	C	S	c	s
0	1	0	0	0	4	4	EOT	DC4	\$	4	D	T	d	t
0	1	0	1	1	5	5	ENQ	NAK	%	5	E	U	e	u
0	1	1	0	0	6	6	ACK	SYN	&	6	F	V	f	v
0	1	1	1	1	7	7	BEL	ETB	'	7	G	W	g	w
1	0	0	0	0	8	8	BS	CAN	(	8	H	X	h	x
1	0	0	1	1	9	9	HT	EM	)	9	I	Y	i	y
1	0	1	0	0	A	A	LF	SUB	*		J	Z	j	z
1	0	1	1	1	B	B	VT	ESC	+	.	K	A/I	k	ä/ı
1	1	0	0	0	C	C	FF	FS	.	<	L	O/\	l	ö/ı
1	1	0	1	1	D	D	CR	GS	-	=	M	U/ı	m	u/ı
1	1	1	0	0	E	E	SO	RS		>	N	^	n	ß/~
1	1	1	1	1	F	F	SI	US	/	?	O	_	o	DEL

HEXADECIMAL = COLUMN + ROW

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Appendix F. Spanish/US Code Chart

Bits b7 → b6 → b5 → b4 b3 b2 b1 ↙ ↘ Column Row					0	0	0	0	1	1	1	1
					00	01	10	11	00	01	10	11
					0	1	2	3	4	5	6	7
0	0	0	0	0	NUL	DLE	SP	0	§/@	P	'	p
0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q
0	0	1	0	2	STX	DC2	"	2	B	R	b	r
0	0	1	1	3	ETX	DC3	£/#	3	C	S	c	s
0	1	0	0	4	EOT	DC4	\$	4	D	T	d	t
0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
0	1	1	0	6	ACK	SYN	&	6	F	V	f	v
0	1	1	1	7	BEL	ETB	'	7	G	W	g	w
1	0	0	0	8	BS	CAN	(	8	H	X	h	x
1	0	0	1	9	HT	EM	)	9	I	Y	i	y
1	0	1	0	A	LF	SUB	.		J	Z	j	z
1	0	1	1	B	VT	ESC	+	.	K	i/[	k	°/!
1	1	0	0	C	FF	FS	.	<	L	Ñ/\	l	ñ/!
1	1	0	1	D	CR	GS	-	=	M	¿/]	m	¿/!
1	1	1	0	E	SO	RS		>	N	^	n	~/~
1	1	1	1	F	SI	US	/	?	O	_	o	DEL

HEXADECIMAL = COLUMN + ROW

730-A

Appendix G. Control Code Keystrokes

The following table lists the keystrokes necessary for generating control codes. Control codes can be issued from the keyboard by depressing the Control Key simultaneously with another key.

CONTROL CODES			KEYSTROKES	
Control Code	Hex	Description	Control Key Depressed with Additional Key (s)	Display*
NUL	00	Null	Space	None
SOH	01	Start of Header	Control-A	S _H
STX	02	Start of Text	Control-B	S _X
ETX	03	End of Text	Control-C	E _X
EOT	04	End of Transmission	Control-D	E _T
ENQ	05	Enquiry	Control-E	E _Q
AK	06	Acknowledge	Control-F	A _K
BEL	07	Bell	Control-G	B _L
BS	08	Backspace	Control-H	B _S
HT	09	Horizontal Tab	Control-I	H _T
LF	0A	Line Feed	Control-J	L _F
VT	0B	Vertical Tab	Control-K	V _T
FF	0C	Form Feed	Control-L	F _F
CR	0D	Carriage Return	Control-M	C _R
SO	0E	Shift Out	Control-N	S _O
SI	0F	Shift In	Control-O	S _I
DLE	10	Data Line Escape	Control-P	D _L
DC1	11	Device Control 1	Control-Q	D ₁
DC2	12	Device Control 2	Control-R	D ₂
DC3	13	Device Control 3	Control-S	D ₃
DC4	14	Device Control 4	Control-T	D ₄
NAK	15	Negative Acknowledge	Control-U	N _K
SYN	16	Synchronous Idle	Control-V	S _Y
ETB	17	End of Transmission Block	Control-W	E _B
CAN	18	Cancel	Control-X	C _N
EM	19	End of Medium	Control-Y	E _M
SUB	1A	Substitute	Control-Z	S _B
ESC	1B	Escape	Control-[	E _C
FS	1C	File Separator	Control-\	F _S
GS	1D	Group Separator	Control-]	G _S
RS	1E	Record Separator	Control-^	R _S
US	1F	Unit Separator	Control-?	U _S

* Control code display visualization with Monitor Mode enabled.

Appendix H. Command Set Summary

- Note:
1. All spaces in the command sequences below are not part of the actual commands and should not be entered as they appear. When commands are input, do not insert any spaces.
 2. All references to lower case L are represented below as l* to differentiate them from the number 1.

COMMAND	COMMAND SEQUENCE	QVT-103	VT131	VT100
SCROLL				
Next Page (NP)	ESC [Pn U	x		
Previous Page (PP)	ESC [Pn V	x		
Scroll Up (SU)	ESC [Pn S	x		
Scroll Down (SD)	ESC [Pn T	x		
Set Margins (DECSTBM)	ESC [Pt ; Pb r	x	x	x
CURSOR POSITIONING				
Cursor Up (CUU)	ESC [Pn A	x	x	x
Cursor Down (CUD)	ESC [Pn B	x	x	x
Cursor Forward (CUF)	ESC [Pn C	x	x	x
Cursor Backward (CUB)	ESC [Pn D	x	x	x
Cursor Position (CUP)	ESC [Pl*; Pc H	x	x	x
Cursor Home (CHP)	ESC [H	x	x	x
Horz & Vert Pos (HVP)	ESC [Pl*, Pc f	x	x	x
Position Home (HPP)	ESC [f	x	x	x
Index (IND)	ESC D	x	x	x
Reverse Index (RI)	ESC M	x	x	x
Next Line (NEL)	ESC E	x	x	x
Save Cursor (DECSC)	ESC 7	x	x	x
Restore Cursor (DECRC)	ESC 8	x	x	x
CHARACTER SET SELECTION				
UK Set = G0 (SCS)	ESC (A	x	x	x
US Set = G0 (SCS)	ESC (B	x	x	x
SpChar = G0 (SCS)	ESC (0	x	x	x
AltROM = G0 (SCS)	ESC (1	x	x	x
AltROM SpChar = G0 (SCS)	ESC (2	x	x	x
UK Set = G1 (SCS)	ESC) A	x	x	x
US Set = G1 (SCS)	ESC) B	x	x	x
SpChar = G1 (SCS)	ESC) 0	x	x	x
AltROM = G1 (SCS)	ESC) 1	x	x	x
AltROM SpChar = G1 (SCS)	ESC) 2	x	x	x
Single Shift 2 (SS2)	ESC N	x	x	x
Single Shift 3 (SS3)	ESC 0	x	x	x
No Attributes (SGR)	ESC [m or ESC [0 m	x	x	x

COMMAND	COMMAND SEQUENCE	QVT-103	VT131	VT100
CHARACTER SET SELECTION continued				
Bold (SGR)	ESC [1 m	x	x	x
Underline (SGR)	ESC [4 m	x	x	x
Blink (SGR)	ESC [5 m	x	x	x
Reverse Video (SGR)	ESC [7 m	x	x	x
German Set = G0 (SCS)	ESC (C	x		
French Set = G0 (SCS)	ESC (D	x		
Spanish Set = G0 (SCS)	ESC (E	x		
German Set = G1 (SCS)	ESC) C	x		
French Set = G1 (SCS)	ESC) D	x		
Spanish Set = G1 (SCS)	ESC) E	x		
Double-Height Top (DECDHL)	ESC # 3	x	x	x
Double-Height Bottom (DECDHL)	ESC # 4	x	x	x
Single-Width (DECSWL)	ESC # 5	x	x	x
Double-Width (DECDWL)	ESC # 6	x	x	x
CHARACTER PROTECTION				
No Protect (DECPRO)	ESC [0)	x	x	
Bold Protect (DECPRO)	ESC [1)	x	x	
UL Protect (DECPRO)	ESC [4)	x	x	
Blink Protect (DECPRO)	ESC [5)	x	x	
Reverse Protect (DECPRO)	ESC [7)	x	x	
All Off Protect (DECPRO)	ESC [254)	x	x	
EDITING				
Erase from cursor (EL)	ESC [K or ESC [0 K			
Erase to cursor (EL)	ESC [1 K	x	x	x
Erase Line (EL)	ESC [2 K	x	x	x
Erase Scrn from cursor (ED)	ESC [J or ESC [0 J			
Erase Scrn to cursor (ED)	ESC [1 J	x	x	x
Erase Screen (ED)	ESC [2 J	x	x	x
Delete Char (DCH)	ESC [Pn P	x	x	
Insert Line (IL)	ESC [Pn L	x	x	
Delete Line (DL)	ESC [Pn M	x	x	
KEYPAD CHARACTER SELECTION				
Numeric Keypad (DECKPAM)	ESC >	x	x	x
Appl Keypad (DECKPAM)	ESC =	x	x	x
PRINTING				
Auto Print On (MC)	ESC [? 5 i	x	x	
Auto Print Off (MC)	ESC [? 4 i	x	x	
Printer Ctrl On (MC)	ESC [5 i	x	x	
Printer Ctrl Off (MC)	ESC [4 i	x	x	
Print Cursor Line (MC)	ESC [? 1 i	x	x	
Print Screen (MC)	ESC [i or ESC [0 i			
		x	x	

COMMAND	COMMAND SEQUENCE	QVT-103	VT131	VT100
PROGRAMMABLE FUNCTIONS				
Prog Function Keys	ESC P key number: key message ESC \			
LEDS ON (DECLL)	ESC [Ps;Ps;Ps;Ps q	x	x	
Clear all LEDS (DECLL)	ESC [q or ESC [0 q	x	x	
REPORTS				
Device Status (DSR) VT102	ESC [5 n	x	x	x
Ready Response (DSR)	ESC [0 n	x	x	x
Malfunction (DSR)	ESC [3 n	x	x	x
Printer Status (DSR)	ESC [? 15 n	x	x	
No Printer (DSR)	ESC [? 13 n	x	x	
Printer not ready (DSR)	ESC [? 11 n	x	x	
Printer Ready (DSR)	ESC [? 10 n	x	x	
Cursor Pos Rqst (DSR)	ESC [6 n	x	x	x
Page Length Query (DSR)	ESC [7 n	x		
Installed Pages Response (2)	ESC [8 n	x		
Installed Pages Response (4)	ESC [9 n	x		
Cursor Pos Rpt (CPR)	ESC [P1*; Pc R	x	x	x
Device Attributes (DA)	ESC [c or ESC [0 c	x	x	x
Device QVT-103	ESC [= 7 c	x		
Device VT131 (DA)	ESC [? 7 c	x	x	
Device VT100 (DA)	ESC [? 1; 2 c			x
Identify Terminal (DECID)	ESC Z	x	x	x
Request Terminal Parameters (DECREQTPARM)	ESC [<sol>	x	x	x
Report Terminal Parameters (DECREPTPARM)	ESC [<sol>;<par>;<nbits>;<xspeed>; <rspeed>;<clkmul>;<flags>			
		x	x	x
RESET				
Reset (RIS)	ESC c	x	x	x
TABS				
Horz Tab Set (HTS)	ESC H	x	x	x
Horz Tab Clear (TBC)	ESC [g or ESC [0 g	x	x	x
Clear All Tabs (TBC)	ESC [3 g	x	x	x

COMMAND	COMMAND SEQUENCE	QVT-103	VT131	VT100
TESTS				
Self Test (DECTST)	ESC [2; 1 y	x	x	x
Host Conn Test (DECTST)	ESC [2; 2 y	x	x	x
Modem Test (DECTST)	ESC [2; 4 y	x	x	x
Printer Test (DECTST)	ESC [2; 16 y	x	x	
Loop Test (DECTST)	ESC [2; 9 y	x	x	x
Host Loop Test (DECTST)	ESC [2; 10 y	x	x	x
Modem Loop Test (DECTST)	ESC [2; 12 y	x	x	x
Printer Loop Test (DECTST)	ESC [2; 24 y	x	x	
TRANSMISSION				
Transmit Mode (DECXMIT)	ESC 5	x	x	
TTC blank (DECTTC)	ESC [0	x	x	
TTC FF (DECTTC)	ESC [1	x	x	
TTC ETX (DECTTC)	ESC [2	x	x	
TTC EOT (DECTTC)	ESC [3	x	x	
TTC CR (DECTTC)	ESC [4	x	x	
TTC DC3 (DECTTC)	ESC [5	x	x	
Set Transmit State (STS)	ESC S	x	x	
ADJUSTMENTS				
Screen Align (DECALN)	ESC # 8	x	x	x
Bottom of Page	ESC [= nn q	x		
SET MODE (ANSI)				
Send All (GATM)	ESC [1 h	x	x	
Lock Keyboard (KAM)	ESC [2 h	x	x	x
Insert Mode On (IRM)	ESC [4 h	x	x	
Erase All	ESC [6 h	x	x	
Local Echo Off (SRM)	ESC [12 h	x	x	x
Full Page (TTM)	ESC [16 h	x	x	
CR & LF (LNM)	ESC [20 h	x	x	x
RESET MODE (ANSI)				
Send Unprotected (GATM)	ESC [1 |*	x	x	
Unlock Keyboard (KAM)	ESC [2 |*	x	x	x
Insert Mode Off (IRM)	ESC [4 |*	x	x	
Erase Unprotected	ESC [6 |*	x	x	
Local Echo On (SRM)	ESC [12 |*	x	x	x
Partial Page (TTM)	ESC [16 |*	x	x	
CR only (LNM)	ESC [20 |*	x	x	x

COMMAND	COMMAND SEQUENCE	QVT-103	VT131	VT100
SET MODE (DECSM)				
Cursor Appl (DECCKM)	ESC [? 1 h	x	x	x
ANSI Mode	ESC [? 2 h	x	x	x
132 Columns (DECCOLM)	ESC [? 3 h	x	x	x
Smooth Scroll (DECSCLM)	ESC [? 4 h	x	x	x
Reverse Video (DECSCLM)	ESC [? 5 h	x	x	x
Origin Set (DECOM)	ESC [? 6 h	x	x	x
Auto Wrap Set (DECAWM)	ESC [? 7 h	x	x	x
AutoRepeat On (DECARM)	ESC [? 8 h	x	x	x
Edit Mode (DECEDM)	ESC [? 10 h	x	x	
Line Transmit (DECLTM)	ESC [? 11 h	x	x	
Space compress (DECSCFDM)	ESC [? 13 h	x	x	
Immediate Trans (DECTEM)	ESC [? 14 h	x	x	
Edit Immediate (DECEKEM)	ESC [? 16 h	x	x	
Ptr FF on (DECPFF)	ESC [? 18 h	x	x	
Full Scrn (DECPEX)	ESC [? 19 h	x	x	
RESET MODE (DECRM)				
Cursor ANSI (DECCKM)	ESC [? 1 I*	x	x	x
VT-52 Mode	ESC [? 2 I*	x	x	x
ANSI Mode	ESC [? 2 h	x	x	x
80 Columns (DECCOLM)	ESC [? 3 I*	x	x	x
Jump Scroll (DECSCLM)	ESC [? 4 I*	x	x	x
Normal Video (DECSCLM)	ESC [? 5 I*	x	x	x
Origin Reset (DECOM)	ESC [? 6 I*	x	x	x
Auto Wrap Reset (DECAWM)	ESC [? 7 I*	x	x	x
AutoRepeat Off (DECARM)	ESC [? 8 I*	x	x	x
Interactive Mode (DECEDM)	ESC [? 10 I*	x	x	
Page Transmit (DECLTM)	ESC [? 11 I*	x	x	
Space Compress Off	ESC [? 13 I*	x	x	
Deferred Trans (DECTEM)	ESC [? 14 I*	x	x	
Edit Deferred (DECEKEM)	ESC [? 16 I*	x	x	
Ptr FF off (DECPFF)	ESC [? 18 I*	x	x	
Scrolling Region (DECPEX)	ESC [? 19 I*	x	x	
SET MODE (QUME PRIVATE)				
Auto Page On	ESC [= 20 h	x		
Suppress 25th Line	ESC [= 30 h	x		
Status Line Reverse Video	ESC [= 31 h	x		
RESET MODE (QUME PRIVATE)				
Auto Page Off	ESC [= 20 I*	x		
Display 25th Line	ESC [= 30 I*	x		
Status Line Normal Video	ESC [= 31 I*	x		

VT52 COMMAND SEQUENCES

COMMAND	COMMAND SEQUENCE
ANSI Mode	ESC <
Cursor Up	ESC A
Cursor Down	ESC B
Cursor Right	ESC C
Cursor Left	ESC D
Cursor Home	ESC H
Direct Cursor Address	ESC Y (line) (Column)
Reverse Linefeed	ESC I
Applications Keyboard	ESC =
Numeric Keyboard	ESC >
Enter Graphics	ESC F
Exit Graphics	ESC G
Erase to end of Line	ESC K
Erase to end of Screen	ESC J
Auto Print On	ESC A
Auto Print Off	ESC —
Printer Controller On	ESC W
Printer Controller Off	ESC X
Print Line	ESC I
Print Screen	ESC V
Identify	ESC Z
Identify Response	ESC / Z

Appendix I. The Status Lines

Default		OFF-LINE	COL 1	PAGE 1	EDIT	INSERT	KYBD ON	MNTR	ON/OFF	L1 L2 L3 L4
Possible	CAPS	ON-LINE	COL 2 ↓ 132	PAGE 2 ↓ 4	EDIT	INSERT	KYBD LOCK	MNTR	ON/OFF	L1 L2 L3 L4

Tab Line 1234567890123456789012345678901234567890123456789012345678901234567890

Default	SET 1	EIA RS232	CUR BB	80 COL	EM:QVT-103	CR ONLY	SCROLL SM	60 HZ	MAN PAGE
Possible		EIA C.L.	UL BS US NO	132 COL	EM: VT131 VT100 VT52	CR + LF	SCROLL JP	50 HZ	AUTO

Default	SET 2	ON/OFF	KEYRPT	BELL	KEYCLK	SCREEN SAVER	STATUS	LINEWRAP	WPS
Possible			KEYPRT	BELL	KEYCLK	SCREEN SAVER	STATUS STATUS	LINEWRAP	WPS

Default	SET 3	ON/OFF	BREAK	AUTO TURN	AUTO ANSBK	ANSWBK MSG
Possible			BREAK	AUTO TURN	AUTO ANSBK	

Default	SET 4	NORM VID	AUX PORT	SPEED 300	WORD/PAR 7S	TERM CHAR FF	PRINT SCROLL REG
Possible		REVR VID		SPEED 50 ↓ 19200	WORD/PAR 7M 70,7E,7N 80,8E,8N	TERM CHAR NO	PRINT SCREEN

Default	SET 5	EIA PORT	AUTO XON/XOFF	WORD/PAR 7S	PAR CHECK	STOP 1	XMIT 9600	RCV 9600
Possible		EIA PORT	NO XON/XOFF	WORD/PAR 7M 70,7E,7N 80.8E,8N	PAR IGNORE	STOP 2	XMIT 50 ↓ 19200	RCV 50 ↓ 19200

Default	SET 6	FDXA	NO ECHO	INIT XMIT	EOB/DC	ETX/EOT	DISC:	CHAROFF	DLY NORM
Possible		FDXB FDXC HDXA HDXB	LOC ECHO	INIT RCV	EOB/DC	FF/EOT CR/EOT EOT/DLE DC3/EOT /EOT	DISC:	CHAROFF CHAR ON CHAR ON	DLY UK DLY NORM DLY UK

Default	SET 7	XFER ALL	XMIT PAGE	XMIT TERM FP	XMIT EXC IMMED	ERASE ALL
Possible		XFER UNPRCT	XMIT LINE	XMIT TERM PP	XMIT EXC DEFR	ERASE UNPRCT

Default	SET 8	EDIT EXEC IMMED	PROTECT ON/OFF	BOLD	UL	BLINK	REV	NORM
Possible		EDIT EXEC DEFR	PROTECT ON/OFF	BOLD	UL	BLINK	REV	NORM

Default	SET 9	US CHAR	SPACE COMP OFF	EOL RTN	PAGE BOTTOM: 48
Possible		UK CHAR FR GM SP	SPACE COMP ON	OFF RS	24 ↓ 96

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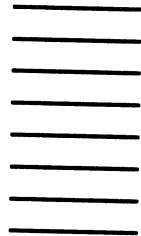
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