VP TERMINAL EMULATION OF TTY

XEROX

VP Series Reference Library
Version 1.0

Table of contents

List of figures

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1. VP Terminal Emulation of TTY overview

The workstation can be used to emulate many different types of terminals. Specific terminals that can be emulated include Digital Equipment Corporation (DEC) VT100, International Business Machine (IBM) 3270, and Teletype Model 35 (KSR) terminals.

This section provides information on how the workstation can emulate Teletype Model 35 (KSR) terminals. A networked workstation with the appropriate software installed can be used as an interactive terminal equivalent to a Teletype Model 35 teletypewriter terminal (TTY). This allows users to establish communication with a host computer and to interact with application programs on that computer.

Related information

The following materials provide information related to the VP Terminal Emulation of TTY application.

VP Series reference library

- Xerox ViewPoint

VP Series training guides

- Xerox ViewPoint

- VP Terminal Emulation of TTY

Hardware/software requirements

The following are the hardware, software, and network services requirements for VP Terminal Emulation of TTY.

Hardware

- A 6085 Professional Computer System, or an 8010 Information System

Software

- Xerox ViewPoint software

- Remote System Administration software

- VP Terminal Emulation of TTY software

- VP Document Editor software

VP Terminal Emulation of TTY software and all prerequisite software must be installed, enabled, and running on the workstation. Before using the software, open the application loader icon and verify that the appropriate software is loaded and running.

The sub-tab titled "Application Loader" in the VP Series reference library contains additional information on the application loader.

Network services

- External Communication Service

Benefits of emulation

TTY emulation provides many benefits for users who use TTY terminals to access data stored on host computers. Specifically, TTY emulation enables users to:

- Communicate with multiple host computers from a single piece of equipment

- Establish connections with different host computers

- Establish a connection for more than one session on the same host computer, or establish connections for sessions on several hosts, using the ViewPoint interface, which allows multiple windows to be opened at the same time

- Manipulate information captured through the emulation process, including printing, filing, formatting, editing, and mailing this information

- Complete other workstation functions, such as mailing or printing, while the host computer is busy processing user requests

- Transfer information created on the workstation into a TTY emulation window

Emulation protocols

All data that is sent and received is handled at the workstation level. The conversion process that takes place between Ethernet protocols and asynchronous protocols to enable emulation is described in the following paragraphs.

The Teletype Model 35 (KSR) terminal uses asynchronous communication protocol. Typically, a TTY terminal communicates with the host computer using a modem and dial-up telephone line to establish and maintain an interactive session.

In the Xerox environment, the workstation becomes the TTY terminal. Instead of using asynchronous communication protocol, the workstation uses Ethernet standard protocol, thus offering more capability than a normal TTY terminal.

VP Terminal Emulation of TTY software converts information sent and received between the workstation and the host computer from Ethernet standard protocol to asynchronous communication protocol, and vice versa. Additionally, it enables information received at the workstation to be presented as it would appear on a TTY terminal, and it correspondingly enables the user to handle this information in the same manner as it would be handled on a TTY terminal.

The conversion between Ethernet protocol and asynchronous protocol is performed on the network level by the External Communication Service.

Using TTY emulation at the workstation

Emulation icons

The TTY Emulators divider is located in the domain divider of the directory (refer to Figure 1-1). This divider lists all RS232C ports that are suitable for TTY emulation use (refer to Figure 1-2).

Note: The same operations can be performed with emulation icons inside the divider as those on the desktop, with the exception of using <PROP'S>.

Multiple emulation icons, representing different access paths from the Xerox network to specific host computers, can reside on the desktop. One icon, for example, might represent a Xerox port set up to support communication with a company's own computer, while another might represent a port set up to support connection with an outside database.
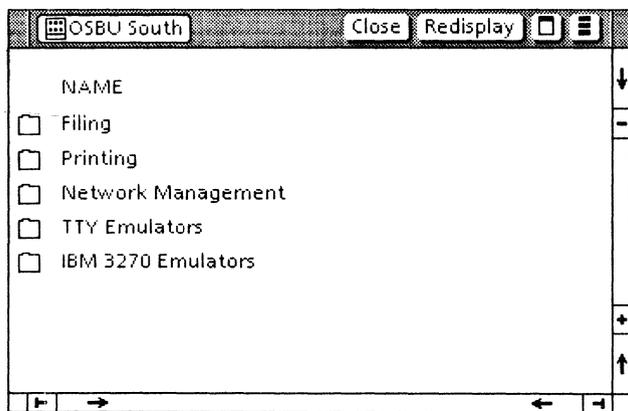
Figure 1-1 **TTY Emulators divider opened within the domain divider**
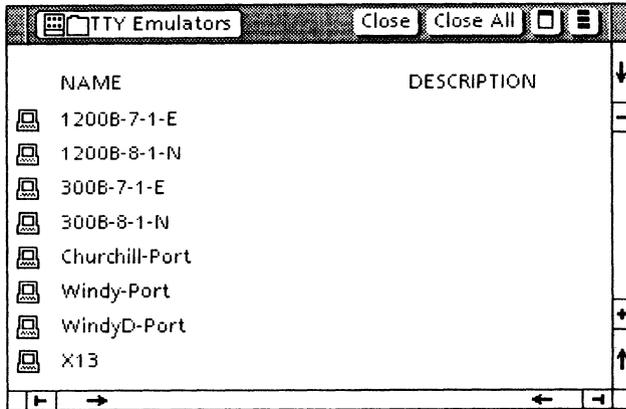
Figure 1-2 **TTY Emulators divider contents**

Emulation properties

Like all objects, emulation icons have properties and options that can be set and changed to fit individual needs. Some information is supplied by the System Administrator, while other information is supplied by the user.

The following are set by the user: icon name, the phone number of the host computer, screen width, autowrap, local echo, line terminators, formatting, and XON/XOff flow control or line-by-line flow control.

Once a session has been established, the workstation becomes bound to a particular port for the duration of the session. Prior to or after the session, that port can be used by any other workstation with TTY emulation installed.

Chapter 3 contains information on changing emulation properties.

Emulation window

When the selected emulation icon opens and [START] is selected, a window that resembles a TTY display screen opens. This means the connection with the host computer is successfully made using the connection parameters specified in the TTY icon's property or option sheet. All user interaction with the host terminal is conducted inside this window, which is 40 lines high. (The maximum number of rows is 40; however, a user can change the number of lines through the TTY property or option sheet.) Text is entered either by typing, copying, or moving it from a document. The number of columns that appear on a line is determined on the Screen Width option of the TTY option sheet.

Incoming characters are placed in the rightmost character position in the bottom line of the screen. When a new line is received from the host computer, the contents of the window are scrolled up a line at a time. Unlike workstation scrolling, this continuous session scrolling cannot be rescrolled once it is out of view.

All data that has been shown on the screen can be captured and transferred for workstation use by selecting [MAKE DOCUMENT]. Selecting [MAKE SCREEN] creates a document containing a single screen of information from the host computer. Chapter 2 contains detailed information regarding [MAKE DOCUMENT] and [MAKE SCREEN].

Once information is captured using [MAKE DOCUMENT] or [MAKE SCREEN], the resulting document can be manipulated the same as any other document.

Using data capture software, such information can be run through a program that formats it as a table, thus permitting easy transfer of data into record files or charts.

The tab titled "VP Data Capture" contains detailed information on data capture software.

Virtual function keys

When a selection is made within the emulation window, the TTY virtual function keys are displayed. Figure 1-3 shows the virtual function keys.

Note: The keytop labels and positioning of keys are different for the 8010 and 6085 workstations.

| Chg Kbd | Show | Escape | Break | ← | ↓ | ↑ | → |
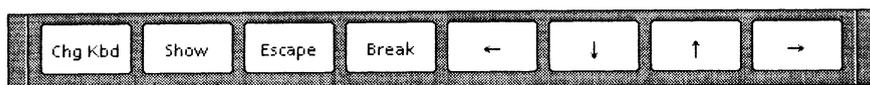
Figure 1-3 Virtual function key layout (for 8010 workstation)

The virtual function keys include:

● < CHG KBD > - Used to go between the main and alternate keyboards.

● < SHOW > - Used to display the current keyboard.

● < ESCAPE > - Equivalent to the TTY escape key.

● < BREAK > - Equivalent to the TTY break key.

Emulation keyboard

When a selection is made within the emulation window, the workstation's keyboard is remapped by the system software to represent the keyboard and functions normally found at a TTY terminal. The keyboard's new meanings are displayed on the screen in a virtual keyboard window. This allows full access to all ASCII control codes, plus the function key corresponding to <BREAK>.

TTY emulation uses one keyboard, the main or generic TTY alphanumeric keyboard. This keyboard is used by all asynchronous type terminals. Pressing the function key corresponding to <SHOW> displays the interpretation of the keyboard. Figures 1-4 and 1-5 illustrates the main TTY keyboard.

Notes:

● For the 8010 workstation, the para-tab key is equivalent to <CTRL>. For the 6085 workstation, <KEYBOARD> is equivalent to <CTRL>; it is not shown in the illustration.

● <CTRL> can be held down while pressing one or more keys to enforce the control state in the same manner as on the actual Teletype Model 35 (KSR) terminal.
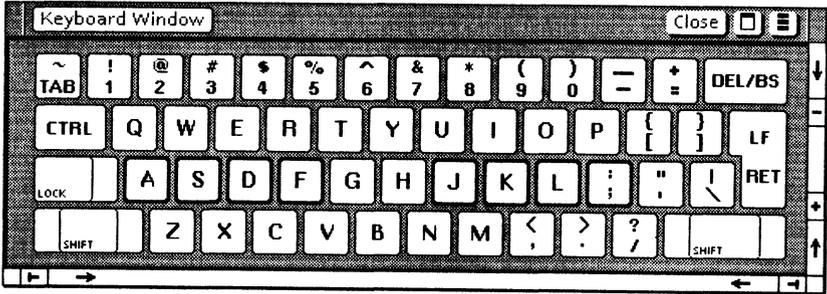
Figure 1-4 **Main TTY virtual keyboard (for 8010 workstation)**
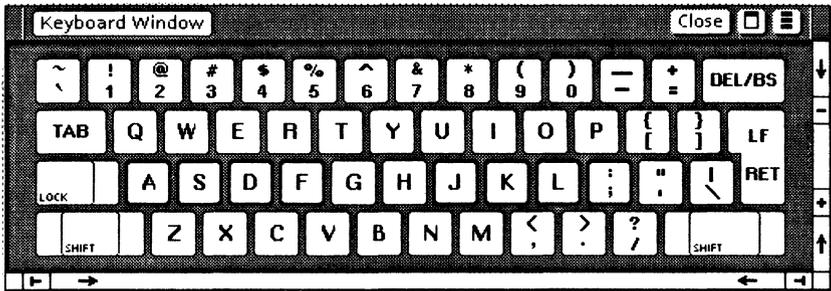
Figure 1-5 **Main TTY virtual keyboard (for 6085 workstation)**

Copying and moving conditions

Copying or moving text into the TTY emulation window can be done. However, note the following conditions:

● Character properties are ignored.

● Characters or symbols without an emulation equivalent (that is, for which no ISO 646 mapping equivalent exists) appear as question marks.

● New line and new paragraph characters are converted to standard carriage returns.

● Text copied or moved into an emulation window always appears at the end of any existing text.

● Information in the emulation window cannot be copied or moved to another location within the emulation window.

The following copying and moving conditions apply when [FORMATTING] is selected in the TTY property or option sheet.

● Lines in the document are broken at space, paragraph, tab, normal tab, hyphen, or discretionary hyphen characters, if possible. These are referred to as line break characters. Line break conditions are as follows:

  - If the line has no line break characters, it is broken at the line limit.

  - If the break occurs immediately after the line limit, the line is broken at the line limit.

- If the break occurs as a result of a space or tab, then that character is placed in the first column of the next line.

- If the source document contains lines that are longer than the line limit setting, they are broken at the line break character that appears on or before the line limit. This is not the same line breaking point seen in the open document.

- Paragraphs entered without explicit new line characters are broken at the line break character that appears closest to the line limit.

Statistics and facts

- The emulator does not attempt to always keep the current type-in point (such as the bottom line) visible. The current type-in point is always viewable by scrolling the window.

- Only ASCII or "plain text" characters (characters that do not have special properties such as bold-facing, underlining, or italicizing) are supported in TTY emulation.

2. Actions and procedures

The actions and procedures contained in this chapter provide the information necessary to use TTY emulation on a networked workstation. They do not provide information on how to use the TTY terminal with any particular host computer or application program. The System Administrator can provide instructions on actual use.

Retrieving a TTY icon

The current set of emulated asynchronous TTY terminals consists of the DEC VT100 and Teletype Model 35 (KSR). Each icon represents a port, that is, an access path to a modem that can be connected by telephone to any desired host computer. These icons are copied from the TTY Emulator divider, which is located in the domain divider in the directory. The System Administrator should be contacted for the names of terminal emulator icons to use, or when there are no TTY icons in the directory.

To retrieve a TTY icon:

1. Open the directory icon and then open the domain divider.

2. Open the TTY Emulators divider. The number of TTY icons available depends on the number of ports available.

3. Copy the desired TTY icon to the desktop. The pointer changes into a miniature TTY icon until a location is selected on the desktop.

Note: The name of each icon is initially set by the System Administrator. The TTY icon on the desktop can be renamed, using the property sheet.

Setting properties for a TTY emulator icon

The TTY icon has various settings that can be changed to fit individual needs. The TTY property sheet is used to set the desired emulation variables, such as port, modem, and terminal type.

To set properties for a TTY emulator icon:

1. Select the TTY icon and press <PROP'S>. Retrieve a TTY icon from the directory if one does not already exist.

2. Select [DISPLAY OPTIONS] so the option sheet appears each time the emulator icon is opened.

   Note: If [DISPLAY OPTIONS] is not selected, the TTY option sheet does not appear and the properties set on the TTY property sheet are used in the emulation session.

3. Select the port items desired. Port items can be changed only if the emulator icon is using a local port on the External Communication Service. If a Communication Interface Unit (CIU) port is being used, only the phone number can be changed.

4. Select the modem items desired.

   Note: Modem items can only be changed if the emulator icon is using a local port on the External Communication Service. If a CIU port is being used, no changes can be made.

5. Select [KSR35] as the terminal type.

6. Select the terminal items desired.

7. Select [DONE] in the window menu to close the property sheet and store any changes made to the property sheet. Select [CANCEL] to close the property sheet without storing the changes.

Starting an emulation session

An emulation session begins when connection with the desired host computer is established. Once it is connected, the TTY icon expands into an emulation window.

To start an emulation session:

1. Open the TTY icon. Copy the desired TTY icon from the directory if one is not on the desktop.

2. Fill in the option sheet and select [START]. Change or add information as desired. Relevant information can be supplied by the System Administrator.

3. Select inside the open emulation window. (A small window displaying the new interpretation of the virtual function keys appears.)

4. Log on by entering the following: name, password, and any other information necessary to start the session appropriate for the host computer.

Displaying the TTY keyboard

Any time a selection is made within a TTY emulation window, the keyboard is assigned new meanings that correspond to the keys of the TTY terminal.

To get a visual representation of the keyboard meanings, press the function key corresponding to <SHOW>.

Select anywhere outside the emulation window to return the keyboard to its original meanings.

Note: The new interpretation takes effect only when the caret is inside the emulation window.

Conducting an emulation session

Once a connection has been made using the steps described in "Starting an emulation session," a session can begin.

To conduct a session, follow the normal instructions for running programs or applications as defined by the host computer.

Log off from the host computer when a session is complete. Then select [CLOSE] at the top of the emulation window.

Note: Closing the emulator window alone does not automatically log a user off the host computer.

Transferring information

Workstation information to host computer

The emulation process allows workstation text to be transferred to a host computer. Select the desired text in the document that is to be transferred into the emulation window, press <COPY> or <MOVE>, then select inside the TTY window. Incoming characters are always placed in the right-most character position at the bottom of the screen.

[MAKE DOCUMENT] -
Transferring TTY information to document form

When [MAKE DOCUMENT] is selected, information from the host computer is transferred into a document. All information appearing on the current screen, plus all the information that has been scrolled off the screen since [MAKE DOCUMENT] was last selected, is available.

To transfer information from an emulation window, select [MAKE DOCUMENT]. This information appears as an icon with a name and time stamp. For example:

1200B-VAX of 4-MAR-86 11:46:52PST

Notes:

• Character properties, such as boldfacing or underlining, are not preserved when [MAKE DOCUMENT] is selected.

• Pressing <STOP> interrupts the [MAKE DOCUMENT] process; however, any information being transferred may be lost or incomplete.

• [RECORD DATA] must be selected in the window management auxiliary menu before [MAKE DOCUMENT] can be selected.

[MAKE SCREEN] -
Transferring specific TTY information to document form

When [MAKE SCREEN] is selected, a single screen of information is transferred from the host computer into a document.

To transfer information from an emulation window, run the session until the desired information appears on the screen, and then select [MAKE SCREEN] in the window menu. This information appears as a document icon with a name and time stamp. For example:

1200B-VAX of 4-MAR-86 11:46:52PST

Notes:

- Character properties, such as boldfacing or underlining, are preserved when [MAKE SCREEN] is selected.

- Pressing <STOP> interrupts the [MAKE SCREEN] process; however, any information being transferred may be lost or incomplete.

Ending an emulation session

Once an emulation session is completed, log off from the host computer. Then select [CLOSE] at the top of the emulation window.

Note: Closing the emulation window alone does not automatically log you off the host computer.

Work strategies

- To accelerate opening the emulation window, set the desired parameters in the TTY property sheet, and then deselect [DISPLAY OPTIONS]. As a result, the TTY option sheet will not appear each time the emulator icon opens. Change the icon name as a reminder (for example, Set Options or Fast Open).

- To improve performance, deselect [RECORD DATA] in the window auxiliary menu if [MAKE DOCUMENT] will not be selected in the current session.

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3. Property/option sheets and windows

This chapter describes the property sheets, option sheets, and windows related to VP Terminal Emulation of TTY.

Property and option sheets are used to specify such information as ports, modems, and terminal properties in order to reflect the actual hardware environment the TTY emulator uses. Windows relevant to emulation allow the user to select commands such as [MAKE DOCUMENT], which is used to transfer information on the TTY screen into a document.
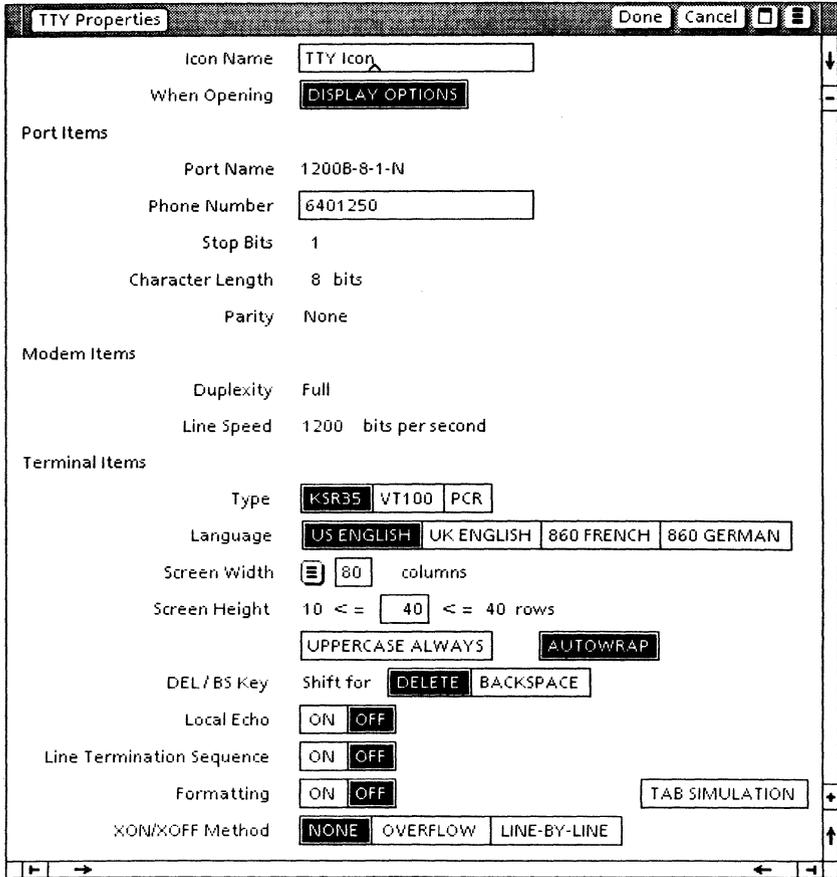
Figure 3-1 **TTY property sheet**

TTY property sheet

The TTY property sheet (Figure 3-1) is used to set various port, modem, and terminal properties to reflect the actual hardware environment the emulator is to be used in. Information entered on the property sheet is retained until it is changed or the icon is deleted.

The TTY property sheet is displayed by selecting the TTY icon and pressing < PROP'S >.

Notes:

● TTY property sheet contains the same properties as the TTY option sheet, with two additional properties: Icon Name and When Opening.

● The property sheet is grouped into three main areas. These areas deal with port configuration, modem settings, and terminal emulation behavior. Port and modem information may be fixed or variable, depending on whether the TTY port used is on a Communication Interface Unit (CIU) or an External Communication Service (ECS) port. The ECS port options are variables and can be changed on this sheet, while the CIU port options are in read-only format. This is because the CIU does not allow its ports to be dynamically configured after it is operational. Because the ECS port allows this possibility, its options can be changed through the property sheet.

Menu commands

The following is a description of the commands located at the top of the property sheet in the gray area.

[DONE]
Closes the property sheet and applies the properties currently set on it. If any information is

incorrect, the property sheet remains open and displays an error message.

[CANCEL]
Closes the property sheet without applying any changes to the properties.

◻

Causes the window management commands to appear when the pointer is placed over the window management auxiliary menu and the left mouse button is held down. The sub-tab titled "Windows" in the VP Series reference library contains detailed information on the window management commands.

▤

Causes the window commands that have been placed in the floating item auxiliary menu to appear when the pointer is placed over the menu and the left mouse button is held down. Window commands are placed in the floating item auxiliary menu when the window is not wide enough to accommodate the commands.

Properties

The following is a list of the properties.

Icon Name

Used to change the name of the emulator icon on a desktop. This allows each TTY icon to be uniquely named.

When Opening

Selecting [DISPLAY OPTIONS] causes the option sheet to be displayed the next time the TTY window is opened. If [DISPLAY OPTIONS] is not selected, the TTY option sheet does not open and all options set on the property sheet are used for that session.

PORT ITEMS:

Port Name

Displays the name given to the port in the Clearinghouse Service in read-only format.

Phone Number

Specifies the full phone number to be dialed for the connection. Valid characters in this item are governed by the autodialer used.

Note: If no phone number is entered and the port is not currently being used, the emulator unconditionally opens the window. This is useful when the RS232C port is configured for manual dialing.

Stop Bits

Indicates the end of a character. This option cannot be changed for CIU port. It may be set to 0, 1, or 2 if the TTY port is attached to a local server port. The communication hardware used in the TTY connection determines what values are legal, as well as whether or not they are electronically changeable.

Character Length
> Designates the length of characters, in bits. This option cannot be changed for CIU ports. This option can be set at 5, 6, 7 or 8 for the local server port. The communication hardware used in the TTY connection determines what values are legal, as well as whether or not they are electronically changeable.

> **Note:** The workstation only supports ISO 646 7-bit ASCII character codes. This option governs the physical length of the character on the transmission line and not the size of the character set supported.

Parity
> Designates the method used to check that data is not garbled in transmission. This option cannot be changed for CIU ports. If it is attached to a local server port, it may be set to [NONE], [EVEN], or [ODD].

MODEM ITEMS:

Duplexity
> Designates whether communication can occur in both directions simultaneously (full duplexity) or in one direction at a time (half duplexity). This setting is in read-only format.

Line Speed
> Specifies the rate at which data passes to and from the host computer (also known as baud rate). This option cannot be changed for CIU ports. The communication hardware used in the TTY connection determines what values are legal, as well as whether or not they are electronically changeable.

TERMINAL ITEMS:

Type
> Specifies the asynchronous terminal to be emulated for the session. For terminal emulation of TTY, [KSR35] is selected.

Language

Specifies the TTY ISO 646 7-bit ASCII character translation table from the TTY translations data file to be used for the session. (For additional information on character codes, refer to Appendix A.) (These tables control the mapping of ISO characters to and from XC1 (Xerox Character Code Standard, Version 1) characters. This does not affect which virtual keyboard is used. That is always determined by the version of the keyboard file that is loaded.

Screen Width

Allows a selection of various screen widths (number of characters that will fit on one line in the window). For terminals in which screen width is not mandatory (for example, the Teletype Model 35), [OTHER] may be selected.

[OTHER]

Displayed if the terminal being emulated does not require a specific screen width. If it is displayed, screen width may be set between 10 and 132 columns inclusive.

Screen Height

Specifies the number of rows desired. May be set between 10 and 40 inclusive. (For those terminals that have a fixed number of lines, this parameter is automatically set to the height of the actual terminal).

[UPPERCASE ALWAYS]

Causes all lowercase alphabetical ISO 646 characters (for example, a-z in English) to be translated to their uppercase counterparts (for example, A-Z) before they are sent to the host computer. This applies to all characters that have a reasonable uppercase equivalent; otherwise, the lowercase character is used. This mapping applies to characters entered into the TTY window from both the keyboard and from copy or move operations.

[AUTOWRAP]

Causes a carriage return - line feed (<CR> - <LF>) action to automatically occur when a line in the window becomes full. Thus, when [AUTOWRAP] is selected and the last character position is reached, the next character received is automatically placed in the first character position of the next line.

Note: If this option is not selected and the last character position is reached, the next character typed in is displayed on top of the previous character in the last position (overwrites).

DEL/BS Key

Specifies the placement of the delete and backspace functions on the DEL/BS key (the upper-right key above the return key). The function that is selected will be the one performed when <SHIFT> is pressed. For example, if BS is chosen, pressing <SHIFT><DEL/BS> will perform a backspace action.

Local Echo

Specifies whether the terminal echoes (displays) the characters typed in, or if the host computer sends these characters to the terminal to be displayed. If [ON] is selected, the terminal displays each character before sending it to the host computer, and does not expect the host computer to echo it back. If two characters appear on the screen, it indicates that both the workstation and the host computer are echoing the character. In this case, the local echo should be disabled at the workstation. The local echo state is reflected in the generic status area by the Local Echo indicator.

Line Termination Sequence (LTS)

Specifies what character, or sequence of characters, replace a carriage return just before it is sent to the host computer. When [OFF] is selected, the carriage return is sent unchanged. When [ON] is selected, the carriage return is replaced by the LTS. The LTS is inserted whenever

a line break occurs in the TTY window. This happens at the following times:

- If the user is copying text from a document, this sequence is inserted each time the current line is full, or a new paragraph character is encountered.

- If the user is typing, this sequence is inserted each time CR is entered.

From 1 to 8 octal characters (separated by spaces or commas) may be specified in the sequence. These octal numbers represent any byte from the standard ISO 646 7-bit character set. Valid separator characters are spaces (" ") or commas (",") in any combination. A comma is legal after a number or space. For example, the following are valid sequences:

- 15,012,23   (= carriage return - line feed - DC3)

- 015, 12   (= carriage return - line feed)

- 23, 015,12 (= DC3 - carriage return - line feed, with any number of spaces)

- 23   (= DC3)

- 0 0 0 1 2 377 10 023   (= 0,0,0,1,2,377,10,23)

- 015, 12, 23, 15 0 23   (combinations of blanks and commas = 15,12,23,15,0,23)

Whatever the sequence is, it is defined by the host computer to which the emulator connects. It is the user's responsibility to enter a LTS that is legal for the host computer.

The legal octal values range from 0 to 377_8. The legal characters are the digits 0 to 7, a space, and a comma. If any illegal entry is made, the option

sheet does not allow the user to proceed until it is corrected. Using octal digits allows the following:

• Total flexibility in specifying any possible ISO character sequence

• Multinational character codes

• Ease of conversion from display representation to binary (and thus better performance).

It is assumed that once they are set, LTS and XON/XOFF do not change often for a given installation.

Formatting and
Line Length

Selecting [ON] causes the Line Length option to appear on the option sheet, allowing specification of the number of characters to be considered per line during copy or move operations. The line length is independent of the screen width. It also automatically inserts an LTS at the end of each transmitted line.

When this option is used while copying or moving data from a document, the TTY emulator determines where a line break should occur to keep the line at or below the specified line limit and inserts a LTS at that point. If the source document has been prepared in fixed pitch as recommended, with margins equal to the line length, these line breaks should occur at approximately the same point in the TTY stream as in the displayed document. This option does not affect the processing of text that is entered at the keyboard.

Chapter 1 describes the emulation conditions relative to the document.

[TAB SIMULATION]

Specifies if tab characters are automatically converted to spaces in the transmit stream. When this option is used while copying or moving data into the TTY window, the emulator determines how many spaces to insert in the line so the character will be properly aligned on the next tab stop. If the document has been prepared in fixed pitch as recommended, the tabs should appear much as they do in the displayed document. When this option is turned off and text is copied or moved from a document, both normal and paragraph tabs are converted to the ASCII horizontal tab character, 011_8.

Note: This option does not affect the processing of text that is entered at the keyboard. [FORMATTING] must be selected for tab simulation to work.

XON/XOFF Method

Allows specification of the type of flow control the terminal should use. There are two types of flow control: overflow or line-by-line. The [OVERFLOW] form is the same as in the CIU, but is implemented at the workstation when the XON/XOFF exceeds one character. Otherwise, it is implemented at the External Communication Service. When [OVERFLOW] is selected, it issues the XOFF sequence whenever the rate of incoming data is greater than the rate it can be processed (after a certain internal threshold is exceeded). When [LINE-BY-LINE] is selected, the workstation suffixes each line sent to the host computer with the XOFF sequence, then waits for the host to send back the XON sequence before sending the next line.

Note: If a value other than [NONE] is selected, it implies that the host computer accepts and uses the specified form of flow control. If the user does not ensure that this is true, unpredictable results may occur. The system may even appear to stop processing (as it waits for an XON that never comes). In this case, pressing <STOP> terminates the process.

If a CIU port that has its own flow control is used, no terminal flow control is allowed (a message is posted). If the CIU port has flow control disabled, then the terminal may display [NONE] (no flow control specified), [OVERFLOW], or [LINE-BY-LINE]. (Local ports always display these options.) The CIU's flow control should be used whenever possible, because it is the system element closest to the port. It has the best chance, therefore, of issuing XOFF before any data is lost.

When [OVERFLOW] or [LINE-BY-LINE] is selected, two additional lines appear that allow the XON and XOFF sequences to be specified. Each sequence may have up to 8 octal numbers in it. The rules governing the entry of these sequences are the same as for specifying the LTS. However, if XON and XOFF sequences are to be used, they must not be empty (Nil) or the property sheet will not close.

When [LINE-BY-LINE] is selected, the XOFF sequence is appended to each line sent to the host computer. That is, the XOFF sequence is sent after each LTS is sent. The emulator then waits for the host computer to send back the XON sequence before it transmits the next line of data. For example, a CR could be the line termination sequence, a DC3 could be the XOFF sequence, and a DC1 could be the XON sequence received from the host computer to resume transmission. The emulator places the characters CR DC3 at the end of each transmitted line, and then waits to receive DC1 from the host computer before transmitting the next line, and so forth.

<STOP> can be used to terminate the copy or move action at any time in order to restart keyboard entry and/or reselect text for another copy or move action from a document.

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```
┌─────────────────────────────────────────────────────────────────┐
│ ▓TTY Options▓                              [Start] [Cancel] [□] [▤]│
├─────────────────────────────────────────────────────────────────┤
│ Port Items                                                      ↕ │
│                                                                 ─ │
│            Port Name    1200B-8-1-N                               │
│                                                                   │
│         Phone Number    │6401250              │                  │
│                                                                   │
│            Stop Bits    1                                         │
│                                                                   │
│     Character Length    8  bits                                  │
│                                                                   │
│               Parity    None                                      │
│                                                                   │
│ Modem Items                                                       │
│                                                                   │
│            Duplexity    Full                                      │
│                                                                   │
│           Line Speed    1200   bits per second                   │
│                                                                   │
│ Terminal Items                                                    │
│                                                                   │
│                 Type    ▐KSR35▌ VT100  PCR                        │
│                                                                   │
│             Language    ▐US ENGLISH▌ UK ENGLISH│860 FRENCH│860 GERMAN│
│                                                                   │
│         Screen Width    (▤) │80 │    columns                      │
│                                                                   │
│        Screen Height    10 < =  │  40│ < = 40  rows               │
│                         │UPPERCASE ALWAYS│     ▐AUTOWRAP▌          │
│                                                                   │
│          DEL / BS Key   Shift for  ▐DELETE▌ BACKSPACE             │
│                                                                   │
│           Local Echo    ON ▐OFF▌                                  │
│                                                                   │
│ Line Termination Sequence  ON ▐OFF▌                              │
│                                                                   │
│           Formatting    ON ▐OFF▌              │TAB SIMULATION│   ◆│
│                                                                   │
│     XON/XOFF Method     ▐NONE▌ OVERFLOW │LINE-BY-LINE│          ↑ │
├─────────────────────────────────────────────────────────────────┤
│ │►│ → │                                              ←  │◄│      │
└─────────────────────────────────────────────────────────────────┘
```

Figure 3-2 TTY option sheet

TTY option sheet

The TTY option sheet (Figure 3-2) is used to configure various port, modem, and terminal settings to reflect the actual hardware environment the emulator is to be used in. Information entered on the option sheet is used for the duration of the current session and then discarded.

The TTY option sheet is displayed by selecting the TTY icon and pressing <OPEN>.

Notes:

• TTY option sheet contains the same properties as the TTY property sheet, with the exception of two properties: Icon Name and When Opening.

• The option sheet is grouped into three main areas. These areas deal with port configuration, modem settings, and terminal emulation behavior. Port and modem information may be fixed or variable, depending on whether the TTY port used is on a Communication Interface Unit (CIU) or an External Communication Service (ECS) port. The ECS port options are variables and can be changed on this sheet, while the CIU port options are in read-only format. This is because the CIU does not allow its ports to be dynamically configured after it is operational. Because the ECS port allows this possibility, its options can be changed through the option sheet.

Menu commands

The following is a description of the commands located at the top of the option sheet in the gray area.

[START]
Opens the emulator window and establishes a connection with the host. If the connection cannot be made, an error message is displayed and the window does not open.

[CANCEL]

Closes the option sheet without applying any changes to the properties.

◻

Causes the window management commands to appear when the pointer is placed over the window management auxiliary menu and the left mouse button is held down. The sub-tab titled "Windows" in the VP Series reference library contains detailed information on the window management commands.

▤

Causes the window commands that have been placed in the floating item auxiliary menu to appear when the pointer is placed over the menu and the left mouse button is held down. Window commands are placed in the floating item auxiliary menu when the window is not wide enough to accommodate the commands.

Options

The following is a list of the options.

PORT ITEMS:

Port Name
Displays the name given to the port in the Clearinghouse Service in read-only format.

Phone Number
Specifies the full phone number to be dialed for the connection. Valid characters in this item are governed by the autodialer attached to the port.

Note: If no phone number is entered and the port is not currently being used, the emulator unconditionally opens the window. This is useful when the RS232C port is configured for manual dialing.

Stop Bits
Indicates the end of a character. This option cannot be changed for CIU port. It may be set to 0, 1, or 2 if the TTY port is attached to a local server port. The communication hardware used in the TTY connection determines what values are legal, as well as whether or not they are electronically changeable.

Character Length
Designates the length of characters, in bits. This option cannot be changed for CIU ports. This option can be set at 5, 6, 7 or 8 for the local server port. The communication hardware used in the TTY connection determines what values are legal, as well as whether or not they are electronically changeable.

Note: The workstation only supports ISO 646 7-bit ASCII character codes. This option governs the physical length of the character on the transmission line and not the size of the character set supported.

Parity

Designates the method used to check that data is not garbled in transmission. This option cannot be changed for CIU ports. If it is attached to a local server port, it may be set to [NONE], [EVEN], or [ODD].

MODEM ITEMS:

Duplexity

Designates whether communication can occur in both directions simultaneously (full duplexity) or in one direction at a time (half duplexity). This setting is in read-only format.

Line Speed

Specifies the rate at which data passes to and from the host computer (also known as baud rate). This option cannot be changed for CIU ports. The communication hardware used in the TTY connection determines what values are legal, as well as whether or not they are electronically changeable.

TERMINAL ITEMS:

Type

Specifies the asynchronous terminal to be emulated for the session. For terminal emulation of TTY, [KSR35] is selected.

Language

Specifies the TTY ISO 646 7-bit ASCII character translation table from the TTY translations data file to be used for the session. (For additional information on character codes, refer to Appendix A.) These tables control the mapping of ISO characters, to and from XC1 (Xerox Character Code Standard Version 1) characters. This does not affect which virtual keyboard is used. That is always determined by the version of the keyboard file that is loaded.

Screen Width

Allows a selection of various screen widths (number of characters that will fit on one line in the window). For terminals in which screen width is not mandatory (for example, the Teletype Model 35), [OTHER] may be selected.

[OTHER]

Displayed if the terminal being emulated does not require a specific screen width. If it is displayed, screen width may be set between 10 and 132 columns inclusive.

Screen Height

Specifies the number of rows desired. May be set between 10 and 40 inclusive. (For those terminals that have a fixed number of lines, this parameter is automatically set to the height of the actual terminal.)

[UPPERCASE ALWAYS]

Causes all lowercase alphabetical ISO 646 characters (for example, a-z in English) to be translated to their uppercase counterparts (for example, A-Z) before they are sent to the host computer. This applies to all characters that have a reasonable uppercase equivalent; otherwise, the lowercase character is used. This mapping applies to characters entered into the TTY window from both the keyboard and from copy or move operations.

[AUTOWRAP]

Causes a carriage return - line feed (<CR> - <LF>) action to automatically occur when a line in the window becomes full. Thus, when [AUTOWRAP] is selected and the last character position is reached, the next character received is automatically placed in the first character position of the next line.

Note: If this option is not selected and the last character position is reached, the next character typed in is displayed on top of the previous character in the last position (overwrites).

DEL/BS Key

Specifies the placement of the delete and backspace functions on the DEL/BS key (the upper-right key). The function that is selected is the one performed in this key's shifted position. For example, if BS is chosen, pressing <SHIFT> <DEL/BS> will perform a backspace action.

Local Echo

Specifies whether the terminal echoes (displays) the characters typed in, or if the host computer sends these characters to the terminal to be displayed. If [ON] is selected, the terminal displays each character before sending it to the host computer, and does not expect the host computer to echo it back. If two characters appear on the screen, it indicates that both the workstation and the host computer are echoing the character. In this case, the local echo should be disabled at the workstation. The local echo state is reflected in the generic status area by the Local Echo indicator.

Line Termination Sequence (LTS)

Specifies what character, or sequence of characters, replace a carriage return just before it is sent to the host computer. When [OFF] is selected, the carriage return is sent unchanged. When [ON] is selected, the carriage return is replaced by the LTS. The LTS is inserted whenever a line break occurs in the TTY window. This happens at the following times:

- If the user is copying text from a document, this sequence is inserted each time the current line is full, or a new paragraph character is encountered.

- If the user is typing, this sequence is inserted each time CR is entered.

From 1 to 8 octal characters (separated by spaces or commas) may be specified in the sequence. These octal numbers represent any byte from the standard ISO 646 character set. Valid separatorcharacters are spaces (" ") or commas (",") in any combination. A comma is legal after a number or space. For example, the following are valid sequences:

- 15,012,23 (= carriage return - line feed - DC3)

- 015, 12 (= carriage return - line feed)

- 23, 015,12 (= DC3 - carriage return - line feed, with any number of spaces)

- 23 (= DC3)

- 0 0 0 1 2 377 10 023 (= 0,0,0,1,2,377,10,23)

- 015, 12, 23, 15 0 23 (combinations of blanks and commas = 15,12,23,15,0,23)

Whatever the sequence is, it is defined by the host computer to which the emulator connects. It is the user's responsibility to enter a LTS that is legal for the host computer.

The legal octal values range from 0 to 377_8. The legal characters are the digits 0 to 7, a space, and a comma. If any illegal entry is made, the option sheet does not allow the user to proceed until it is corrected. Using octal digits allows the following:

- Total flexibility in specifying any possible ISO character sequence

- Multinational character codes

- Ease of conversion from display representation to binary (and thus better performance)

It is assumed that once they are set, LTS and XON/XOFF do not change often for a given installation.

**Formatting and
Line Length**

Selecting [ON] causes the Line Length option to appear on the option sheet, allowing specification of the number of characters to be considered per line during copy or move operations. The line length is independent of the screen width. It also automatically inserts an LTS at the end of each transmitted line.

When this choice is selected while copying or moving data from a document, the TTY emulator determines where a line break should occur to keep the line at or below the specified line limit and inserts an LTS at that point. If the source document has been prepared in fixed pitch "Terminal 12 Font" as recommended, with margins equal to the line length, these line breaks shoulddoccur at approximately the same point in the TTY stream as in the displayed document. This option does not affect the processing of text that is entered at the keyboard.

Chapter 1 describes the emulation conditions relative to the document.

[TAB SIMULATION]

Specifies if tab characters are automatically converted to spaces in the transmit stream. When this option is used while copying or moving data into the TTY window, the emulator determines how many spaces to insert in the line so the character will be properly aligned on the next tab stop. If the document has been prepared in fixed pitch "Terminal 12 Font" as recommended, the tabs should appear much as they do in the displayed document. When this option is turned off and text is copied or moved from a document, both normal and paragraph tabs are converted to the ASCII horizontal tab character, 011_8.

Note: This option does not affect the processing of text that is entered at the keyboard. [FORMATTING] must be selected for tab simulation to work.

XON/XOFF Method

Allows specification of the type of flow control the terminal should use. There are two types of flow control: overflow or line-by-line. The [OVERFLOW] form is the same as in the CIU, but is implemented at the workstation when the XON/XOFF exceeds one character. Otherwise, it is implemented at the External Communication Service. When [OVERFLOW] is selected, it issues the XOFF sequence whenever the rate of incoming data is greater than the rate it can be processed (after a certain internal threshold is exceeded). When [LINE-BY-LINE] is selected, the workstation suffixes each line sent to the host computer with the XOFF sequence, then waits for the host to send back the XON sequence before sending the next line.

Note: If a value other than [NONE] is selected, it implies that the host computer accepts and uses the specified form of flow control. If the user does not ensure that this is true, unpredictable results may occur. The system may even appear to stop processing (as it waits for an XON that never comes). In this case, pressing <STOP> terminates the process.

If a CIU port that has its own flow control is used, no terminal flow control is allowed (a message is posted). If the CIU port has flow control disabled, then the terminal may display [NONE] (no flow control specified), [OVERFLOW], or [LINE-BY-LINE]. (Local ports always display these options.) The CIU's flow control should be used whenever possible, because it is the system element closest to the port. It has the best chance, therefore, of issuing XOFF before any data is lost.

When [OVERFLOW] or [LINE-BY-LINE] is selected, two additional lines appear that allow the XON and XOFF sequences to be specified. Each sequence may have up to 8 octal numbers in it.

The rules governing the entry of these sequences are the same as for specifying the LTS. However, if XON and XOFF sequences are to be used, they must not be empty (Nil) or the option sheet will not close.

When [LINE-BY-LINE] is selected, the XOFF sequence is appended to each line sent to the host computer. That is, the XOFF sequence is sent after each LTS is sent. The emulator then waits for the host computer to send back the XON sequence before it transmits the next line of data. For example, a CR could be the line termination sequence, a DC3 could be the XOFF sequence, and a DC1 could be the XON sequence received from the host computer to resume transmission. The emulator places the characters CR DC3 at the end of each transmitted line, and then waits to receive DC1 from the host computer before transmitting the next line, and so forth.

<STOP> can be used to terminate the copy or move action at any time in order to restart keyboard entry and/or reselect text for another copy or move action from a document.

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Figure 3-3 **TTY window**

TTY window

The TTY window (Figure 3-3) is used to display the data that is transmitted to and from the host computer.

Note: It is possible to open a TTY icon within a divider.

The TTY window is displayed by selecting an emulator icon and pressing <OPEN>. After the sheet is completed, [START] should be selected.

The TTY emulation window is divided into two areas, a terminal status area and the main text area.

Menu commands

The following is a description of the commands located at the top of the document window in the gray area.

[CLOSE]
Closes the window and returns the emulator to icon form.

[MAKE DOCUMENT]
Provides a document containing all information appearing in the current screen plus all the information that has been scrolled off the screen since the last time [MAKE DOCUMENT] was selected.

Note: This implies that the current screen will appear both as the last lines of the document that is currently created and as the first lines of the next one.

The document title is in the following form:

< icon name > of < date/time of day >

Example:

VAX Demo of 1-Apr-85 11:30:52

The document name can be renamed through its property sheet.

[MAKE SCREEN]
Captures the textual information currently displayed on the screen and copies it into a document. The captured information is displayed as defined by the screen width and height set on the icon's property sheet. The document title is in the following form:

< icon name > of < date/time of day >

The document name can be renamed through its property sheet.

◻

Causes the window management commands to appear when the pointer is placed over the window management auxiliary menu and the left mouse button is held down. The sub-tab titled "Windows" in the VP Series reference library contains detailed information on the window management commands.

▤

Causes the window commands that have been placed in the floating item auxiliary menu to appear when the pointer is placed over the menu and the left mouse button is held down. Window commands are placed in the floating item auxiliary menu when the window is not wide enough to accommodate the commands.

The commands found in the floating item auxiliary menu are as follows:

[ENABLE/DISABLE LOCAL ECHO]
Controls whether or not the emulator echoes (displays) each character sent to the host computer. Its setting is reflected in the Local Echo indicator line in the terminal status area.

[ENABLE/DISABLE ON LINE]
Controls whether the emulator runs off-line locally or is connected to a remote host computer. Its setting is reflected in the On Line indicator line in the status area.

[USE/DON'T AUTO-NEWLINE]
Causes a carriage return received from the host computer to be followed immediately by a line feed, thereby advancing the caret to column one of the next line. If is not selected, causes a carriage return recevied from the host computer to not be followed by line feed, thereby moving the caret to column one of the current line.

[ENABLE/DISABLE AUTOWRAP]
Causes a carriage return - line feed (<CR> - <LF>) action to automatically occur when a line in the window becomes full. Thus, when this feature is selected and the last character position is reached, the next character received is automatically placed in the first character position of the next line.

Note: If this option is not selected and the last character position is reached, the next character typed in is displayed on top of the previous character in the last position (overwrites).

[ENABLE/DISABLE LTS]

Allows the user to toggle states during a TTY session. When the line termination sequence (LTS) is enabled, pressing the return key sends the sequence of octal codes specified by the Line Termination Sequence field in the TTY property/option sheet. When the LTS is disabled, only a carriage return is sent.

[RECORD/DON'T RECORD DATA]

Allows the user to control when incoming data is recorded to the backing document. It can be turned on and off at any time, and it provides the user with the option of not recording data that does not need to be saved. Performance is increased slightly when [DON'T RECORD DATA] is selected, because the data is not being copied to the backing file. When [RECORD DATA] is selected, data is placed in the backing file as it is scrolled out of the TTY window.

[SHOW TERMINAL PROPS]

Allows the user to jump or tab to preselected columns on a line. These tabs may be changed individually, or they can be totally cleared and reset.

Status area

Status area symbols are displayed only when the terminal being emulated provides some sort of visual feedback. Information in the status area is displayed in a read-only format and scrolling within this area is currently not available. During emulation, LED indicator lights appear in the status area. A filled-in circle is "on."

The following symbols in the status area display for all TTY emulation terminal types.

On Line

When on, indicates the emulator is on-line and ready to transmit or receive messages. When off, indicates the emulator is off-line and does not communicate with the host device. It is set and cleared by selecting [ENABLE/DISABLE ON LINE] in the floating point auxiliary menu.

Local Echo

Indicates the emulator is operating in local echo mode. It is set and cleared by selecting [ENABLE/DISABLE LOCAL ECHO] in the floating point auxiliary menu.

KBD Locked

Indicates that the keyboard has been turned off. The emulator is still able to receive data from the host computer. This can be cleared by entering and exiting the Set-up mode.

Record

When on, indicates that screen data is being saved to a backing document as it gets scrolled off the screen. It can be turned on and off at any time, and it provides the user with the option of not recording data that does not need to be saved. Performance is increased slightly when [RECORD DATA] is off because the data is not being copied to the backing file.

Main text area

The main text area can contain up to 40 lines as specified by the Screen Height option. The line length is specified by the Screen Width option in the TTY property sheet. It may be regarded as a depiction of the last lines of interaction between the operator and the remote computer. Each line of input or output appears on the bottom line (normally) of the window; when the carriage return is encountered, the contents of the window are scrolled up one line to make room for the next line. Not all 40 lines may be visible if the window is smaller than its standard size: the scroll bar may be used to bring any of the last 40 lines into view in this case. In particular, the last line can be scrolled out of view, in which case user type-in and computer

response become invisible. The emulator does not attempt to always keep the current type-in point (that is, the bottom line) visible. The current type-in point is always viewable using the window scroll bars.

Note: The caret changes color depending on the location of the selection. It is gray when the input is not in the emulation window, and it is black when the selection appears in the emulation window.

For some terminal types no random cursor control movement is possible. In this case, the caret always remains at the last line sent for the host computer. This is the case for the Teletype Model 35 (KSR) emulator. Pressing a mouse button anywhere in the window changes the selection (that is, the type-in point); however, the current emulator caretposition is not affected.

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| Terminal Properties		Done	Cancel	□	▤
Screen Tabs	**SET**	CLEAR			
Column	9				
Column	17				
Column	25				
Column	33				
Column	41				
Column	49				
Column	57				
Column	65				
Column	73				
Column	81				
Column	89				
Column	97				
Column	105				
Column	113				
Column	121				
Column	0				
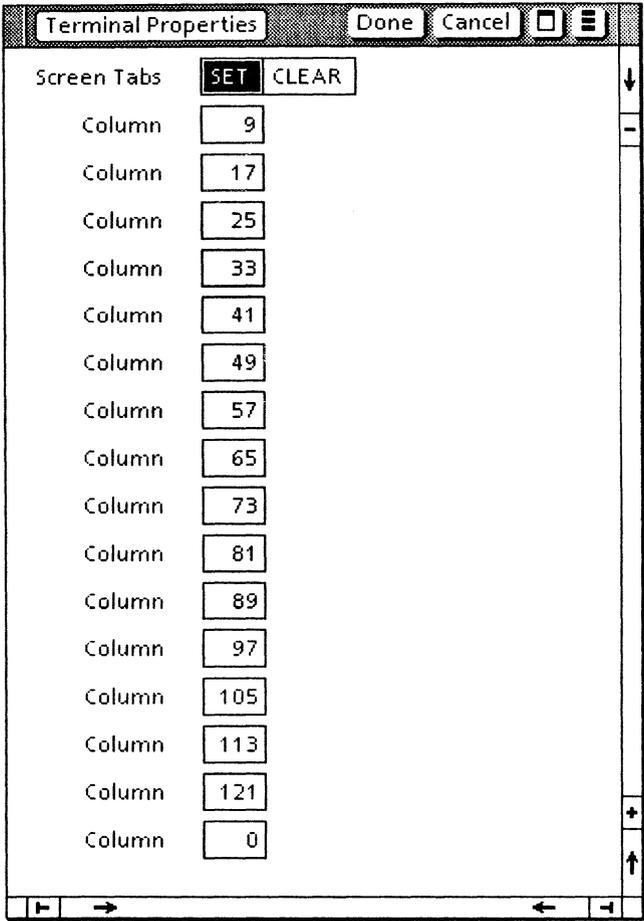
Figure 3-4 Show terminal property sheet

Show terminal property sheet

The show terminal property sheet (Figure 3-4) is used to set the location of tab stops, allowing users to jump or reselect columns on a line. These tabs can be changed individually, or they can be totally cleared and reset.

Note: This property sheet is independent of the document tab settings property.

The show terminal property sheet is displayed by selecting [SHOW TERMINAL PROPS] in the floating point auxiliary menu of the terminal emulation window.

Menu commands

The following is a description of the commands located at the top of the property sheet in the gray area.

[DONE]
> Closes the property sheet and applies the properties currently set on it. If any information is incorrect, the property sheet remains open and displays an error message.

[CANCEL]
> Closes the property sheet without applying the currently displayed settings.

◻
> Causes the window management commands to appear when the pointer is placed over the auxiliary menu and the left mouse button is held down. The sub-tab titled "Windows" in the VP Series reference library contains detailed information on the window management commands.

▤

Causes the window commands that have been placed in the floating item auxiliary menu to appear when the pointer is placed over the menu and the left mouse button is held down. Window commands are placed in the floating item auxiliary menu when the window is not wide enough to accommodate the commands.

Properties

The following is a list of the properties.

[SET]
Sets the position of tab stops. Only positive values are acceptable. The first box on the property sheet represents the first tab stop, the second box represents the second tab stop, and so on. After all tabs are set, a blank box appears when <NEXT> is pressed. Up to 132 tab stops can be set.

Note: It is not possible to set a tab stop beyond the specified screen width set in the TTY option or property sheet.

[CLEAR]
Clears any predefined tabs at one time.

Appendix A:
Character codes

This appendix contains technical information relating to character codes, including translation files, control sequences, commands, and features.

Character codes and translation file

The TTY emulator supports the International Standard Organization (ISO) 646 7-bit coded character set interchange standard, of which ASCII is a subset. Character codes are translated to and from workstation characters by means of translation tables within the TTY translations data file. This file contains one translation table for each variation of the ISO 646 character set. The translation tables within this file are enumerated in the Language option of the property/option sheet. The first table in the file is listed as the first option, the second table is listed as the second option, and so on.

The TTY translation data file is separate; it can be changed or replaced without having to change the system it is used with. This flexibility allows the workstation to handle multinational TTY emulation in a uniform manner. ISO 646 characters can be mapped into XC1 characters. All variations in the character sets are taken care of within the data files.

The translation file contains the appropriate mappings between the ISO 646 character codes and the Xerox Character Encoding Standard. The character mappings for the US English characters are shown in Table A-1.

The keyboard is used to send various codes to the host computer. Some keys do not produce displayable characters but do send codes to the host computer. These keys include the carriage return (015_8), line feed (012_8), backspace (010_8), <ESC> (033_8), and <DELETE> (177_8). Other keys, such as <CTRL> and <SHIFT>, do not transmit codes when typed; instead, they modify the codes transmitted by other keys. Table A-2 shows the control codes sent when <CTRL> is held down.

Table A-1 US English ASCII character codes

Key	Lower-case Octal Code	Upper-case Octal Code	Key	Octal Code	Key	Octal Code
A	141	101	(Space)	040	:	072
B	142	102	!	041	;	073
C	143	103	"	042	<	074
D	144	104	#	043	=	075
E	145	105	$	044	>	076
F	146	106	%	045	?	077
G	147	107	&	046	@	100
H	150	110	'	047	[	133
I	151	111	(	050	\	134
J	152	112	)	051	]	135
K	153	113	*	052	^	136
L	154	114	+	053	_	137

Table A-1 **US English ASCII character codes (continued)**

Key	Lower-case Octal Code	Upper-case Octal Code	Key	Octal Code	Key	Octal Code
M	155	115	,	054	\	140
N	156	116	-	055	{	173
O	157	117	.	056	|	174
P	160	120	/	057	}	175
Q	161	121	0	060	~	176
R	162	122	1	061		
S	163	123	2	062		
T	164	124	3	063		
U	165	125	4	064		
V	166	126	5	065		
W	167	127	6	066		
X	170	130	7	067		
Y	171	131	8	070		
Z	172	132	9	071		

Table A-2   **Control codes sent using <CTRL> + <KEY>**

<CTRL> + <KEY>	Octal Code Trans- mitted	Mne- monic Function	<CTRL> + <KEY>	Octal Code Trans- mitted	Mne- monic Function
(Space)	000	NUL	P	020	DLE
A	001	SOH	Q	021	DC1
B	002	STX	R	022	DC2
C	003	ETX	S	023	DC3
D	004	EOT	T	024	DC4
E	005	ENQ	U	025	NAK
F	006	ACK	V	026	SYN
G	007	BELL	W	027	ETB
H	010	BS	X	030	CAN
I	011	HT	Y	031	EM
J	012	LF	Z	032	SUB
K	013	VT	[	033	ESC
L	014	FF	\	034	FS
M	015	CR	]	035	GS
N	016	SO	^	036	RS
O	017	SI	__	037	US

Control sequences, commands, and features

All incoming ISO 646 characters in the range of octal 40_8 to 176_8 (inclusive) are displayable in the TTY window and appear in the TTY backing file (the contents of [MAKE DOCUMENT] and [MAKE SCREEN] operation). All other ISO 646 characters except the following are ignored:

BEL (7_8)	Not stored into the backing file, but generates a tone when received
BS (10_8)	Performs a backspace on the display, and on the document
CR (15_8)	Positions the cursor to the beginning of the current line on the display
FF (14_8)	Performs a backspace on the display and inserts a page break in the document
LF (12_8)	Goes to the current column in the next line on the display, and inserts a new line + x number of spaces. **Note:** x = number of spaces to current column
TAB (11_8)	A tab is inserted in the backing file, but has no visible effect in the TTY window

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