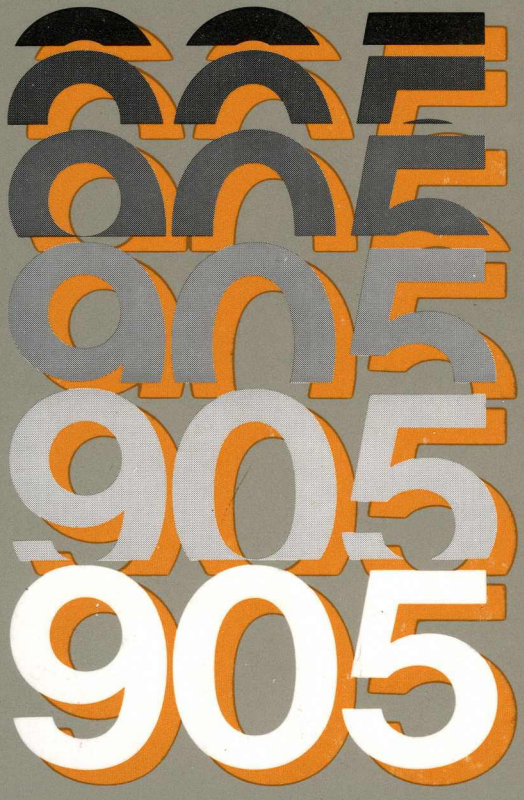
TeleVideo®
Display Terminal
Operator's Manual



TeleVideo Systems, Inc.

TELEVIDEO®
905 VIDEO DISPLAY TERMINAL
OPERATOR'S MANUAL

TeleVideo Document 131975-00-B
1 June 1986

Copyright

Disclaimer

TeleVideo Systems, Inc. makes no representations or warranties with respect to this manual. Further, TeleVideo Systems, Inc. reserves the right to make changes in the specifications of the product described within this manual at any time without notice and without obligation of TeleVideo Systems, Inc. to notify any person of such revision or changes.

Televideo Systems, Inc., 1170 Morse Avenue, P.O. Box 3568,
Sunnyvale, CA 94088-3568 408/745-7760

FCC Class A Warning

This peripheral equipment generates, uses, and can radiate radio frequency energy. If not installed and used in accordance with the instruction manual, it may cause interference with radio emissions. This peripheral equipment has been tested and found to comply with the limits for a Class A computing device, pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against radio frequency interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own risk and expense will be required to correct the interference. The use of nonshielded I/O cables may not guarantee compliance with FCC RFI limits.

TABLE OF CONTENTS

2. SET UP

3. OPERATING THE 905

4. MAINTENANCE AND ASSISTANCE

5. PROGRAMMING THE 905

APPENDICES

LIST OF TABLES

LIST OF FIGURES

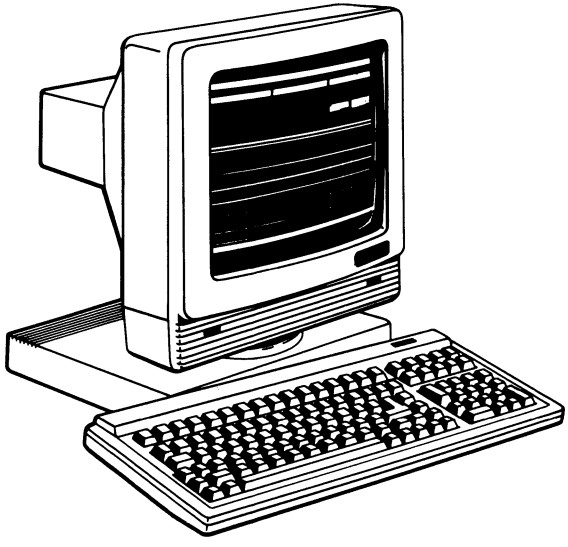
LIST OF FIGURES (continued)

INTRODUCTION

MEET THE 905 TERMINAL

The 905 terminal is the low-cost, high-quality member of the TeleVideo ASCII terminal family. It is compatible with the TeleVideo 925 and 910 terminals, as well as ADDS Viewpoint A2, ADDS Regent 25, ADM 3A/5, Hazeltine 1410/1500, and Qume QVT 101 codes. It also features an operator-selectable WordStar mode that changes the editing and function key codes to the most-used WordStar commands.

The 905 offers a 14-inch, high-resolution screen; tilt-and swivel case; 25th status/message line; 32 function keys (16 programmable); and an accounting-style numeric keypad.



USING THIS MANUAL

Chapter 1 contains step-by-step instructions showing how to install the terminal.

Chapter 2 tells how to set the terminal's operating characteristics and configure it to communicate with your computer and printer.

Chapter 3 describes the keys and terminal operations controlled from the keyboard.

Chapter 4 has a troubleshooting table and tells how to get assistance if you have questions or problems.

Chapters 5 is for programmers. It explains how the terminal operates and all the programming commands.

Reference material is found at the back of the manual: appendices, glossary, index, and a programmer's quick reference guide.

Attention, Please

This manual has three types of notices you should read carefully:

NOTE: Information of special interest or importance about a feature.

WARNING! This procedure might destroy data or damage equipment. Make sure you read and understand thoroughly what you are doing before proceeding.

STOP! This procedure might cause you physical harm. Stop what you're doing and read instructions carefully before proceeding. Call a service technician, if necessary.

Ordering Other Publications

TeleVideo offers a maintenance manual for the 905 (PN 131978-00) and a free booklet showing how to incorporate terminal programming commands in a program written in BASIC (PN 113000-80). The maintenance manual is $50.

To order the free programming booklet, check the box on the reader comment card included with this manual and mail it postage-free (in the USA) to TeleVideo. Mailing the card from outside the USA requires proper postage. Or contact TeleVideo at the phone numbers listed below and ask for the Literature Department.

To order the maintenance manual: In the USA or Canada, copy or tear out the order page following this section and fill it in. Send orders to:

TeleVideo Systems, Inc.	Svle:	408-745-7760
P.O. Box 3568	Telex:	474-5041
Sunnyvale, CA 94088-3568	Fax:	408-734-1927
Attn: Spare Parts Department	TWX:	910-338-7633

From Latin or South America, contact your distributor or use the order page.

If you have any questions about ordering a manual, call the Order Entry Department at the telephone numbers listed above.

European customers should contact one of the regional sales offices listed below to order a maintenance manual.

Northern Europe
Saturnusstraat 25
2132 HB Hoofdorp
The Netherlands
Phone: 011.31.2503.35444
Telex: 84474615
(74615 TLVDO NL)

Southern Europe
3 bis rue leCorbusier
bat. Berne Silic 244
94568 Rungis Cedex
France
Phone: 011.33.1.4687.34.40
Telex: 842205191
(TVIVID 205191F)

United Kingdom
Dorna House,
Guildford Rd., West End
Surrey GU249PW
England
Phone: 011.44.9905.6464
Telex: 851858922
(858922 TELVID G)

MANUAL ORDER FORM

Copy or tear out this page and fill in completely. Mail to the address below. If you have any questions, call the TeleVideo Spare Parts Department at 408\745-7760.

_____
Name

_____
Shipping address (street and number; we cannot ship to a P.O. box)

_____

_____
City/State/ZIP (US) Country

Please send _____ (quantity) maintenance manuals for

_____ (products) at $60 each ($50 plus $10 shipping).

METHOD OF PAYMENT (check one)

☐ Charge account (established charge customers)

Account number _____

P.O. number _____

☐ Prepayment

Include check or money order for the amounts listed above, made out to **TeleVideo Systems, Inc.** Do not send cash.

☐ COD (U.S. only)

TeleVideo Systems, Inc.
Attn: Spare Parts Dept.
P.O. Box 3568
Sunnyvale, CA 94086-3568
U.S.A.

1. INSTALLATION

1. INSTALLATION

INSTALLATION STEPS

Review the entire installation procedure before installing your 905 terminal. Make sure you have the necessary cables and prepare a suitable location (Step 3).

Obtaining the Interface Cables

The cables for attaching your terminal to a computer or modem and printer are not included with the terminal. The service technician in your organization should be able to obtain the necessary cables, or you can contact a computer supply dealer.

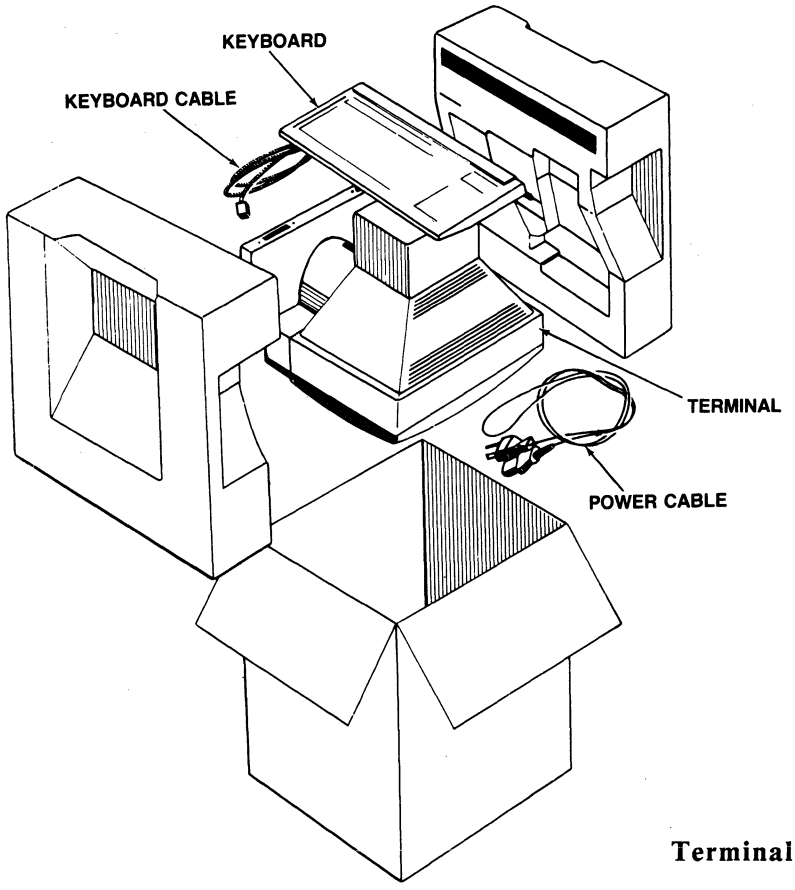
If the distance between the terminal and your computer or modem is less than 50 feet, connect them with an RS-232C interface cable.

For distances greater than 50 feet, consult your dealer or distributor for help in selecting the correct interface. Step 5 shows how to connect the 905 to a computer.

Connect the terminal to a printer with an RS-232C interface cable, as described in Step 6.

Appendix D contains information about connecting a computer or modem and a printer with RS-232C interfaces.

You should find (in addition to this manual):

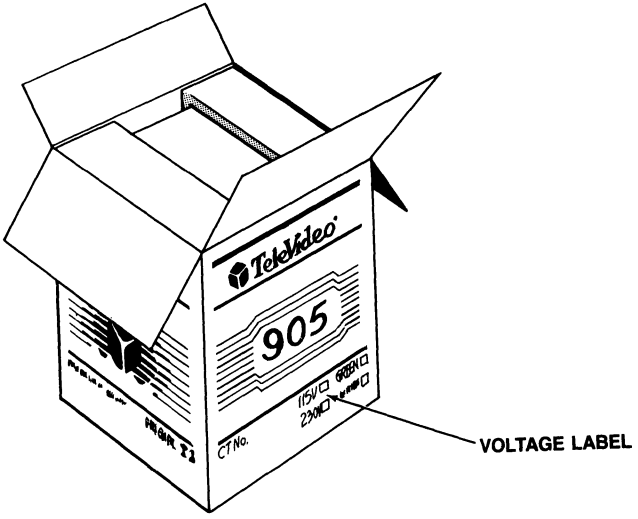


Terminal Components
Figure 1-1

Inspect all parts for damage. If anything is missing or damaged, contact your distributor or dealer.

Save the shipping material in case you move or ship the terminal again.

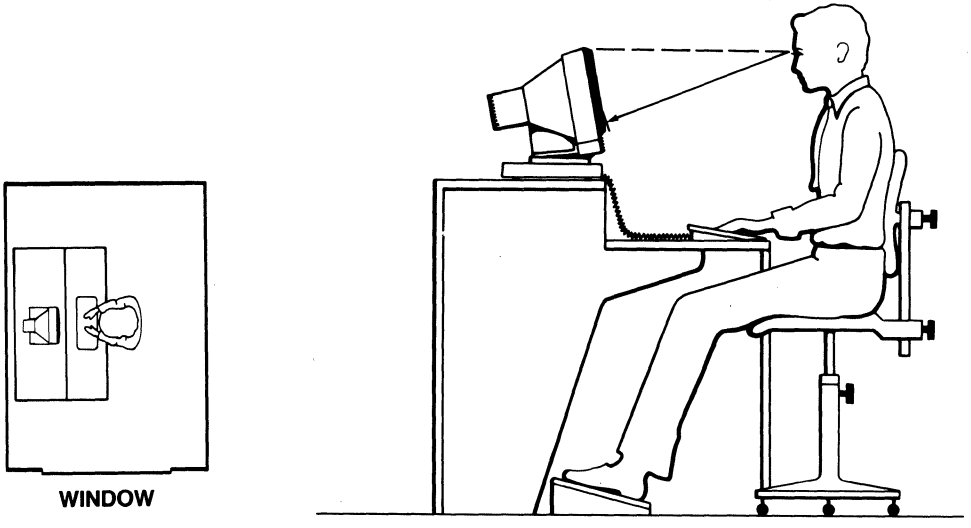
STOP! Never open the terminal case. You can receive a serious electrical shock, even when the terminal is off and unplugged. Always call a service technician if you feel any service to the interior of the terminal is necessary.



Voltage Label
Figure 1-2

Before you connect the terminal to power or the computer line, make sure its voltage matches your outlet. Check the label on the carton stating whether its setting is 115 or 230 volts. Most U.S. power systems require 115 volts; most European systems require 230 volts.

Contact your dealer or distributor for instructions if you need to change the voltage setting.



Proper Terminal Placement
Figure 1-3

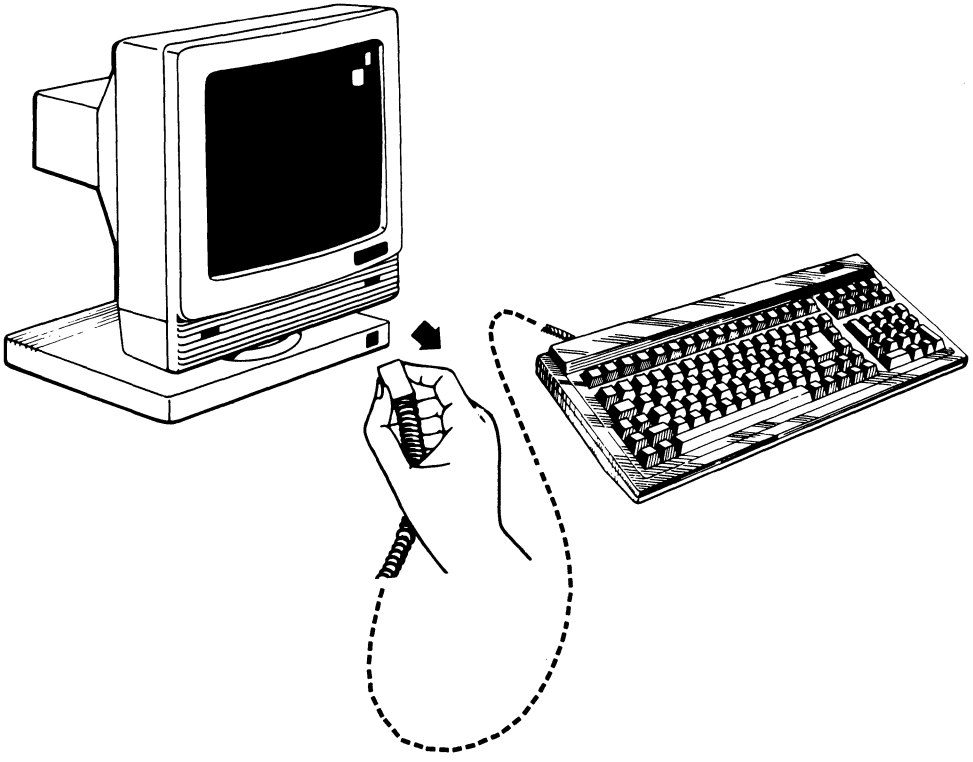
* Choose a location with indirect lighting, away from windows or other sources of bright, direct light.

* Allow 4 inches (10.2 cm) of clearance for ventilation on all sides.

* Place the keyboard lower than the terminal screen.

* Select furniture conducive to good working posture.

You can sit as close to the screen as you wish, without fear of radiation. Tests performed on TeleVideo terminals by Underwriters Laboratories indicate they emit virtually no radiation and pose no health hazard.

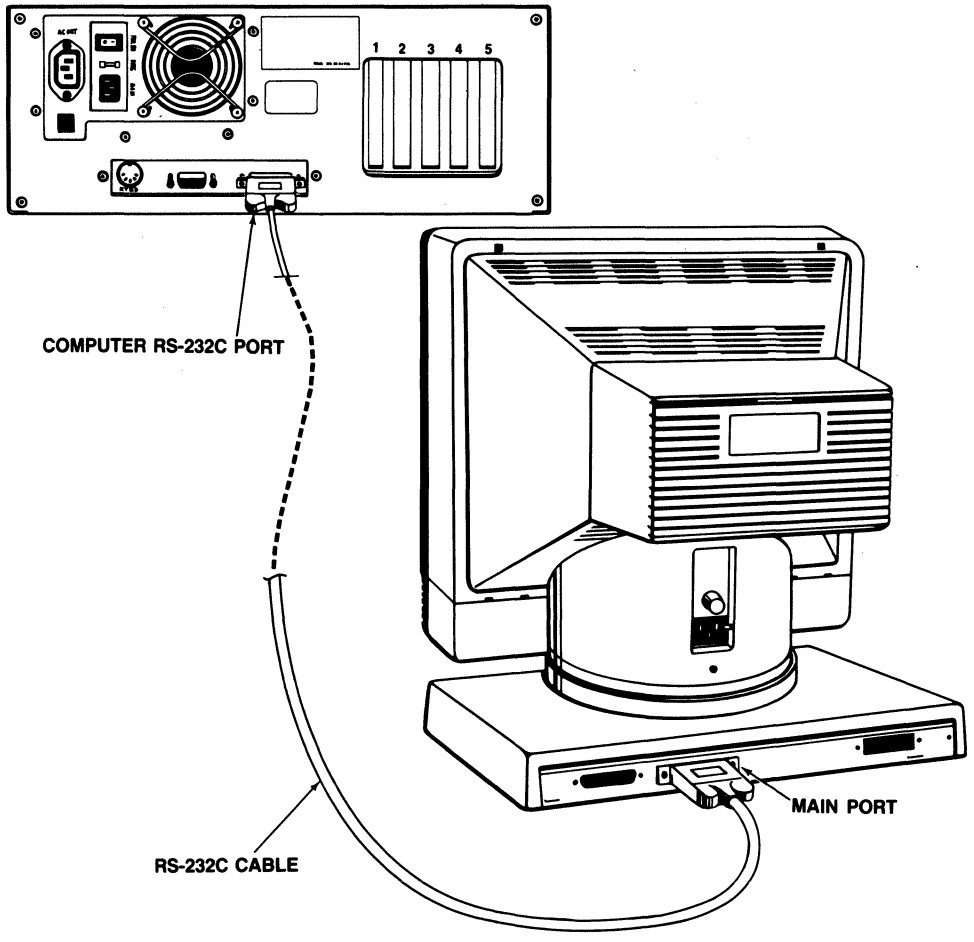


Plugging In the Keyboard
Figure 1-4

Plug the ends of the coiled keyboard cable into the back of the keyboard case and the front of the terminal.

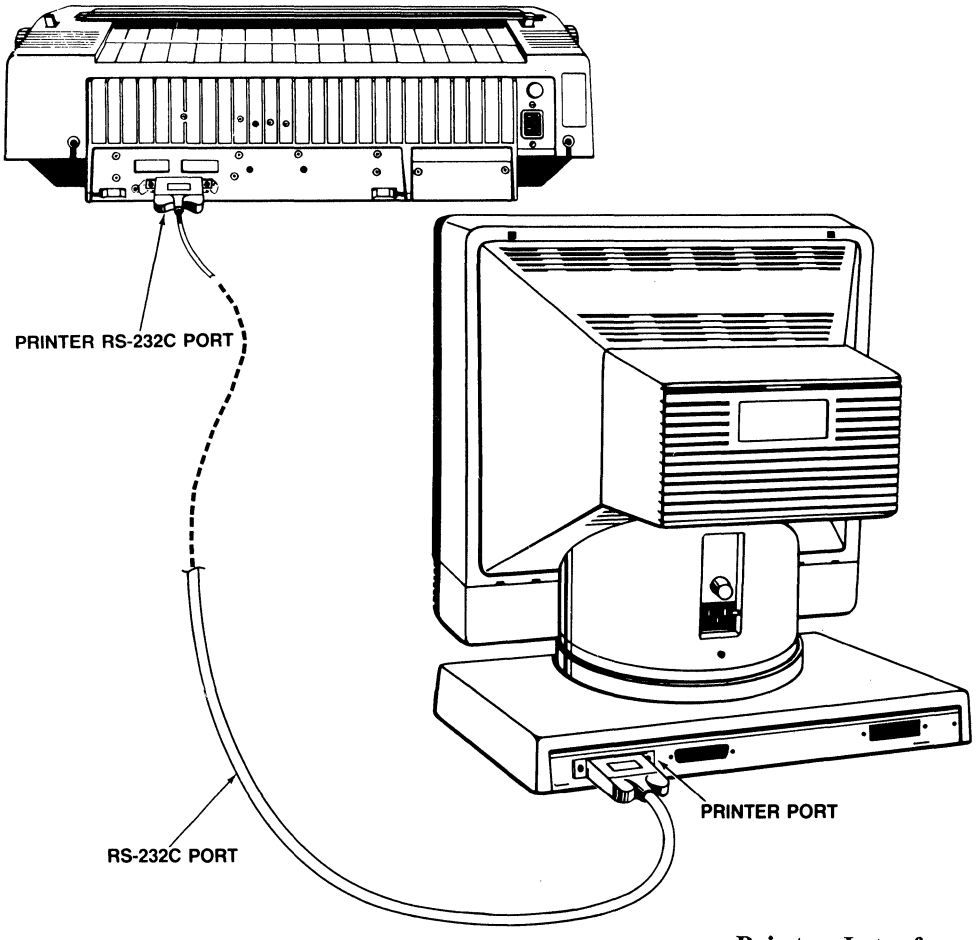
WARNING! Never disconnect or connect the keyboard when the power is on. Doing so can seriously damage the terminal.

On the underside of the keyboard is an adhesive-backed bezel label. If you reprogram the function keys (as described in Chapter 2), you can write the new key codes on the label and stick it onto the keyboard above the function key row.



Computer Interface
Figure 1-5

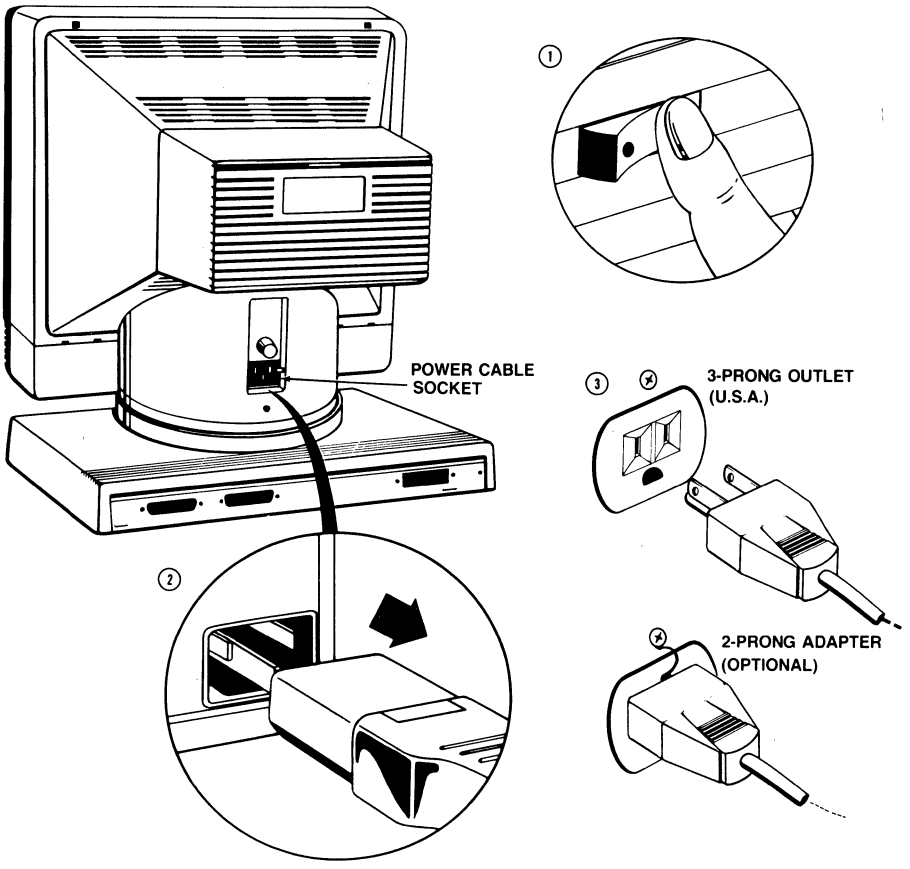
Make sure you are using the appropriate interface, as discussed at the beginning of this chapter. For an RS-232C interface, connect the cable between the 905 main port and the RS-232C port on the computer or modem. If you have to rewire the RS-232C connector for proper communication with the computer, see Appendix D.



Printer Interface
Figure 1-6

Check that your printer is set up to receive data through its serial port (check that it has a serial port!). Connect an RS-232C interface cable to the printer port on the 905 and the serial port on the printer. See Appendix D for information on configuring the cable connectors for proper communication.

Your application programs also affect printer operation. Check with a technician in your organization or your dealer or distributor if you have any questions.



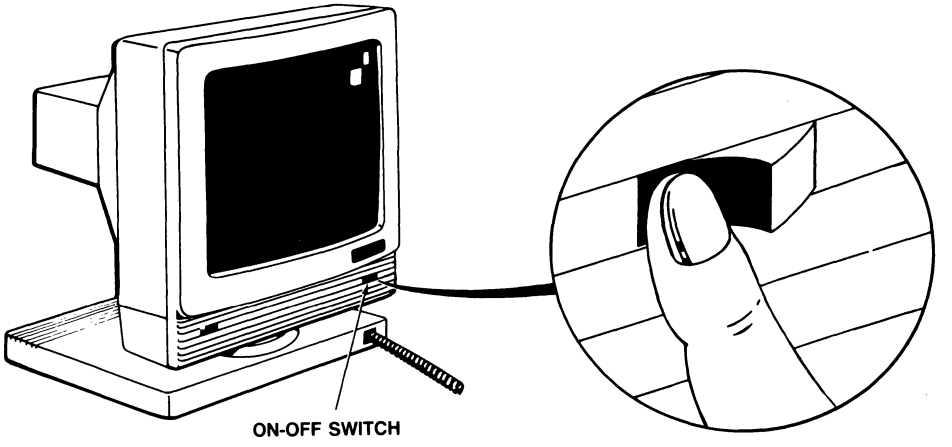
Plugging In the 905
Figure 1-7

Make sure the power switch is off (white dot out) before plugging in the 905.

Plug the power cable into the terminal *first*, then plug the cable into a grounded wall outlet.

NOTE: In the United States, use a 3-prong electrical outlet with a National Electrical Manufacturers Association (NEMA) Standard 5-15R rating. If you use a two-prong adapter, make sure it is properly grounded.

Turning On the Power STEP 8



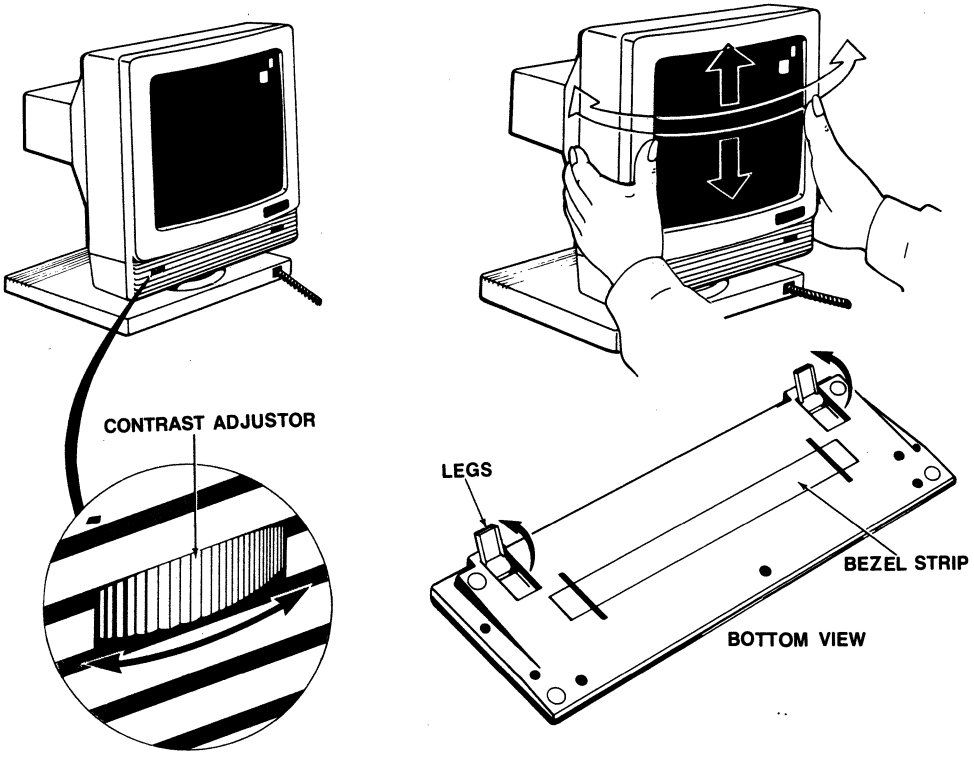
Turning On the Power
Figure 1-8

Push the white dot on the power switch in.

After a moment, the bell sounds; after 10 to 15 seconds the cursor appears.

Adjusting the Screen and Keyboard STEP 9

You can adjust the screen and keyboard to suit your work environment. Figure 1-9 shows how to change the screen contrast to suit your lighting conditions, tilt the screen vertically and horizontally, and flip out the keyboard supports for a more comfortable typing angle.



Adjusting the Terminal
Figure 1-9

THE NEXT STEP

Before using the terminal, check its operating values, as described in the following chapter. Review baud rates for computer and printer, screen features, data word length, parity, and other features before attempting to operate the terminal.

2. SET UP

2. SET UP

The 905 operating characteristics, called *parameters*, are preset at the factory. But before the terminal can work properly, certain parameters may need resetting to agree with your computer, printer, and application program. For example, if the terminal and computer don't communicate at the same speed, they can't communicate at all.

You can reset parameters in *set up.* First press the SET UP key, then display a series of onscreen menus and change any desired parameter values. If you are unfamiliar with set up, read over the next section, "Review of the Set Up Process."

When in doubt about a particular parameter, don't change it. Application programs often set terminal parameters for you automatically. Refer to your computer and application program manuals first, or consult a technician, to get specific information about your system. If you encounter an unfamiliar term in the lists of values, look in the glossary at the back of the manual.

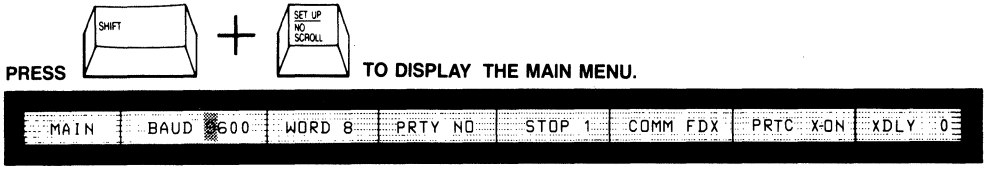
These are the set up menu names and the parameters each menu controls:

* MAIN -- Communications between terminal and computer
* PRINT -- Communications between terminal and printer
* KBD -- Keyboard features and compatibility modes
* SCREEN -- Screen form and attributes
* MISC -- More screen features; programming the function keys
* MISC2 -- Enhanced code compatibility; WordStar mode; reprogramming the answerback message

REVIEW OF THE SET UP PROCESS

The following example shows how to change the screen background from dark to light. This process applies to changing any number of parameters.

Entering Set Up — STEP 1

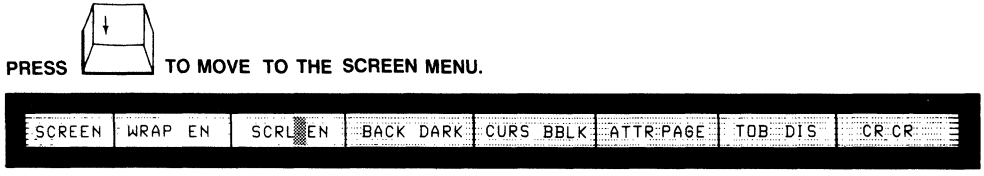


The SET UP Key
Figure 2-1

Press SET UP (SHIFT and NO SCROLL simultaneously). This displays the Main Menu.

You can enter set up any time, but terminal stops accepting incoming data until you leave set up.

Selecting a Set Up Menu — STEP 2

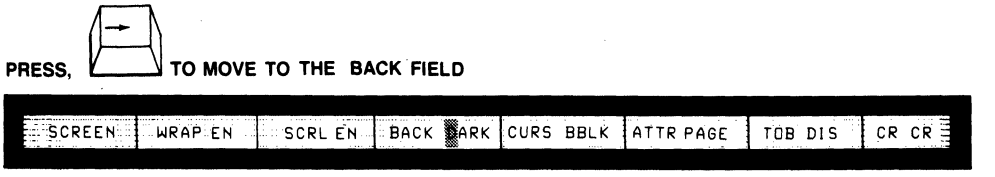


Selecting a Set Up Menu
Figure 2-2

Press the UP or DOWN key to move to the previous or next menu.

Selecting a Set Up Field

STEP 3

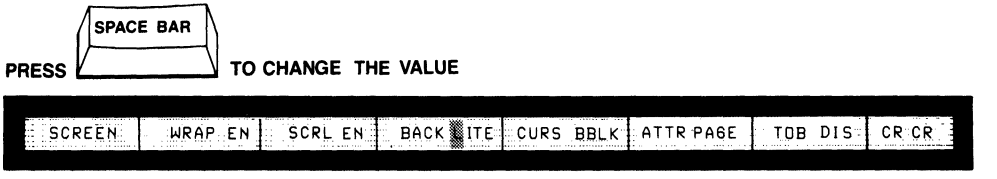


Moving to a Set Up Field
Figure 2-3

Pressing LEFT or RIGHT highlights a field within a menu.

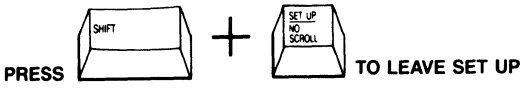
Changing the Set Up Parameter Value

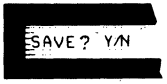
STEP 4



Changing a Value
Figure 2-4

Press the space bar until the desired value appears in the field. Refer to the glossary at the back of the manual if you don't understand what a value means. After changing the value, simply move to the next field or menu, or leave set up.





PRESS Y TO SAVE VALUES

Saving Set Up Values
Figure 2-5

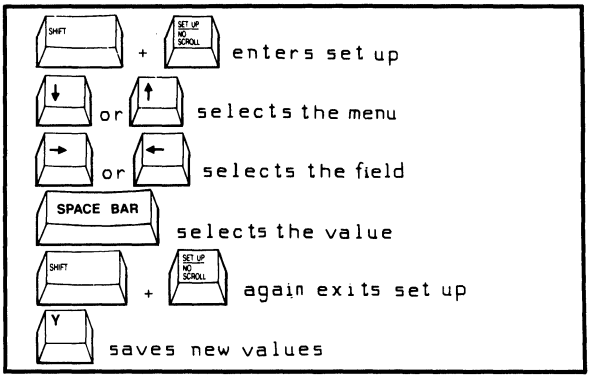
To leave set up and return to the normal operating state, just press SET UP again. The screen asks if you want to save the new set up values in permanent memory.

Press Y so your new values remain in effect until you change them in set up again.

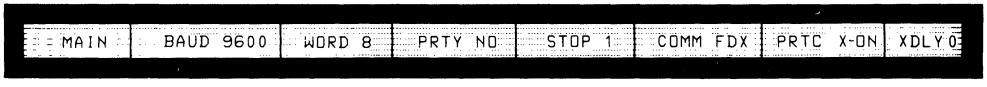
If you press any other key, the values you changed remain in effect only until you turn off the power (or reset the terminal). When you turn the power back on, parameters return to the last values saved in permanent memory.

Main Menu -- Communications Between Terminal and Computer

Baud rate
Word structure
Parity
Stop bits
Communication mode
Handshaking
Transmit delay rate



The Main Menu gives you control over communications between the terminal and computer. These parameters must be set properly before your terminal can transmit data to the computer. If you are in doubt about a setting, don't change it until you consult the manual for your computer or a technical specialist. See the glossary at the end of the manual for detailed descriptions of each parameter.



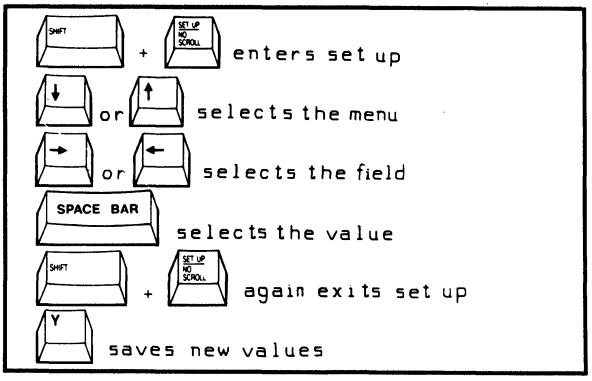
The Main Port Menu
Figure 2-6

Main Port Parameters
Table 2-1

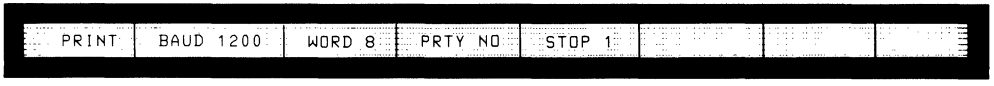
Parameter	Field/ Default Value	Selections
Baud rate	BAUD 9600	Increments from 50 to 19.2K baud.
Word structure	WORD 8	7 or 8 bit data words
Parity	PRTY NO	ODD, EVEN (transmitted and received); MARK, SPAC (transmitted); NO parity.
Stop bits	STOP 1	1 or 2 stop bits
Communication mode	COMM FDX	FDX (full), HDX (half), BLK (block).
Handshaking protocol	PRTC X-ON	X-ON, DTR, or NO.
Transmit delay rate	XDLY 0	Zero through 3 character delays.

Print Menu -- Communications Between Terminal and Printer

Baud rate
Word structure
Parity
Stop bits



The Print Menu controls communications between the terminal and attached printer. As in the Main Menu, these parameters must be set properly before your printer will operate with your 905. Consult a technician or your printer manual before changing any parameters. If you are unsure of a value, don't change it. See the glossary at the end of the manual for detailed descriptions of each parameter.

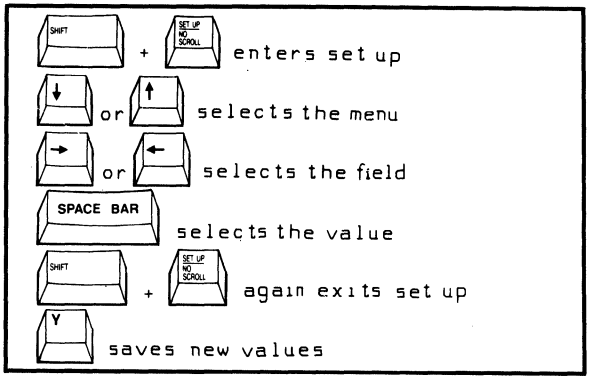


Printer Port Menu
Figure 2-7

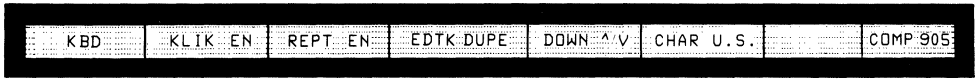
Printer Port Parameters
Table 2-2

Parameter	Field/ Default Value	Selections
Baud rate	BAUD 1200	Increments from 50 to 19.2K baud.
Word structure	WORD 8	7 or 8 bit data words.
Parity	PRTY NO	ODD, EVEN, MARK, SPAC, NO
Stop bits	STOP 1	1 or 2 stop bits.

Keyclick
Key repeat
Editing key mode
DOWN key code
Character sets
Code compatibility



The Keyboard Menu controls key operation and code compatibility modes. Most parameters are a matter of choice, and may be changed by your application program. The glossary explains each parameter in detail. See Appendix G for a summary of commands recognized by the terminal in each mode.



Keyboard Menu
Figure 2-8

Keyboard Parameters
Table 2-3

Parameter	Field/ Default Value	Selections
Keyclick	KLIK EN	EN (most keys click when pressed), DIS (keys are silent when pressed).
Key repeat	REPT EN	EN (most keys repeat), DIS (no keys repeat).
Editing key mode	EDTK DUPE	DUPE (editing key codes go to computer in full or half duplex modes), LOCE (key codes go to terminal only, even in conversational modes).
DOWN key[1] mode	DOWN ^/V	^/V (DOWN key sends cursor down command); ^/J (DOWN key sends line feed command).
Character set[2]	CHAR U.S.	U.S. ASCII, U.K. (United Kingdom), FREN (French), GERM (German), SPAN (Spanish), FINN (Finnish), NORW (Norwegian), ITAL (Italian).
Programming compatibility	COMP 905	Compatibility mode can be TeleVideo 905 or 910, Hazeltine 1410/1500, Viewpoint A2, ADDS Regent 25, ADM 3A/5, OR QVT-101.

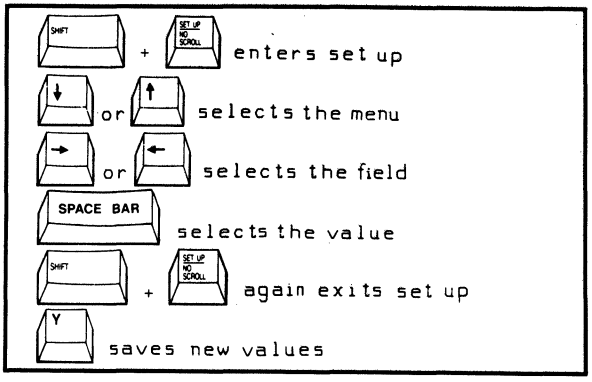
---

[1]Computers may use a line feed code as a delimiter, add a line feed to each carriage return, or add a carriage return to each line feed. Consult your computer manual.

[2]Each foreign character set is available in an option kit containing keycaps and EPROM. See Appendix K for the foreign character set keyboards.

Screen Menu -- Screen Display Features

Word wrap
Autoscroll
Light or dark background
Cursor appearance
Line or page base attributes
Time-out blank
Carriage return



The Screen Menu gives you control over a variety of screen display features. These parameters should be set to best match your application program. Check the glossary for detailed information about screen parameters.

Regardless of how you set screen parameters, your terminal should be able to communicate with the computer, assuming the Main Port parameters described in Table 2-1 are properly set.

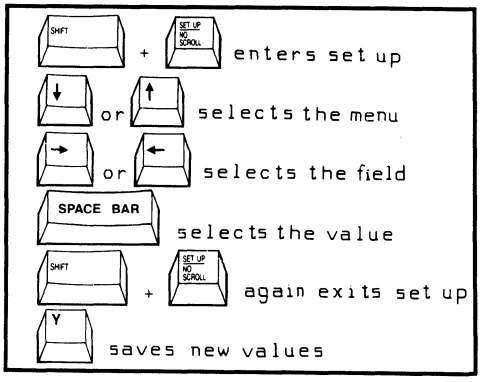
Screen Menu
Figure 2-9

Screen Parameters
Table 2-4

Parameter	Field/ Default Value	Selections
Word wrap	WRAP EN	ENabled (cursor wraps to the start of the next line), DISabled (no wrap).
Autoscroll mode	SCRL EN	ENabled (unprotected data can scroll off the screen), DISabled (data cannot scroll off the screen).
Screen background	BACK DARK	DARK (background is dark with light characters) or LITE (light with dark characters).
Cursor appearance	CURS BBLK	BBLK (blinking block), SBLK (steady block), BUND (blinking underline), SUND (steady underline), NO (invisible).
Attribute base	BASE PAGE	PAGE (attributes affect data from the cursor to the end of the page); LINE (from cursor to end of line).
Time-out or blank	TOB DIS	DISabled (screen always remains on), ENabled (screen blanks after 15 minutes of inactivity)
Carriage return[1]	CR CR	CR (RETURN key sends carriage return only), CRLF (line feed and carriage return).

[1]Computers may use a line feed code as a delimiter, add a line feed to each carriage return, or add a carriage return to each line feed. Consult your computer manual.

Hertz rate
Status line appearance
Saving function key messages
Reprogramming the function keys



The 16 function keys can send 32 separate messages, since pressing a key alone sends a code, and pressing the same key with SHIFT sends a different code. The unshifted keys can be *reprogrammed*--you can change the code that the keys send.

Detailed instructions for reprogramming the function keys follow Table 2-5. Before changing the function key messages, decide if you want to save the new messages in permanent or temporary memory. Messages in temporary memory are destroyed when you turn off or reset the terminal, and the keys return to default values. Messages saved in permanent memory remain until you change them again.

Two screen parameters--status line and hertz rate--are also included in this set up menu.

The Miscellaneous Menu
Figure 2-10

Miscellaneous Parameters
Table 2-5

Parameter	Field/ Default Value	Selections
Status line appearance	STAT EN	ENabled (status line appears on the 25th line during normal operation); DISabled (25th line is blank).
Hertz[1]	HZ 60	Screen refreshes at 50 or 60 hertz.
Saving key contents	SAVE ON	ON (function key contents are saved in permanent memory); OFF (key contents are not saved).
Reprogramming function keys	F1 = 1 SH@CR	See instructions following this table.

[1]Select 60 hertz for most of the United States and Canada and 50 hertz for most other locations. If in doubt, consult a technician.

Reprogramming the Function Keys

1. Position the cursor on the SAVE field in the Miscellaneous Menu.

2. Press the space bar to select ON (permanent memory) or OFF (temporary memory).

3. Press RIGHT to highlight the reprogramming field.

4. Press any unshifted function key to select it for reprogramming. The key number, a code (1, 2, 3) that indicates the destination of the function key message, and the current message appear in the field.

WARNING! The following step destroys the function key message currently displayed in the set up line. Be sure this is what you want to do.

5. Press the CE key to erase the present function key message and begin loading a new message.

6. Press 1, 2, or 3 to choose where the message goes whenever you press the function key:

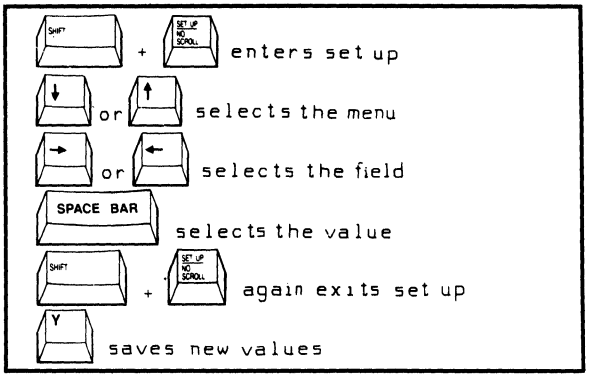
Code	Destination
1	Message goes to the computer
2	Message goes to the terminal
3	Message goes to both computer and terminal

7. Enter any combination of characters and commands for the new message. Each key can hold up to seven bytes. If you make a mistake, press ENTER, then CE. This restarts the process.

8. Press ENTER to end the loading process. You can then leave the field or exit set up.

On the underside of the keyboard is an adhesive-backed bezel label. After you reprogram the function keys, you can write the new key codes on the label and stick it onto the keyboard above the function key row.

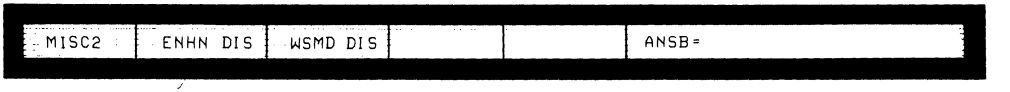
Enhanced compatibility mode
WordStar mode
Coding the answerback message



Your computer program may require an *answerback* message from the terminal. You can load an answerback message in this menu.

This set up menu also lets you enable WordStar mode, in which many editing and function keys send WordStar commands instead of their normal codes. Appendix H contains a list of the keys that send WordStar commands during WordStar mode.

Appendix G shows which codes the terminal recognizes in enhanced compatibility mode.



Second Miscellaneous Menu
Figure 2-11

Miscellaneous 2 Parameters
Table 2-6

Parameter	Field/ Default Value	Selections
Enhanced code compatibility	ENHN DIS	DISabled (only basic code sets available); ENabled (code sets enhanced).
WordStar mode	WSMD DIS	DISabled (WordStar mode disabled); ENabled (function and editing keys send WordStar commands).
Reprogramming the answerback message.	ANSB =	See instructions following this table.

Reprogramming the Answerback Message

1. Enter set up and press DOWN until the Second Miscellaneous Menu appears.

2. Press RIGHT to move to the ANSB field.

3. Press CE to begin loading the answerback message.

   WARNING! Pressing CE clears any existing answerback message!

4. Enter a new message (characters or commands) at the keyboard. It can contain up to eight characters.

   If you make a mistake, press ENTER, then CE. This restarts the process.

5. Press ENTER to end the loading process. You can then leave the field or exit set up.

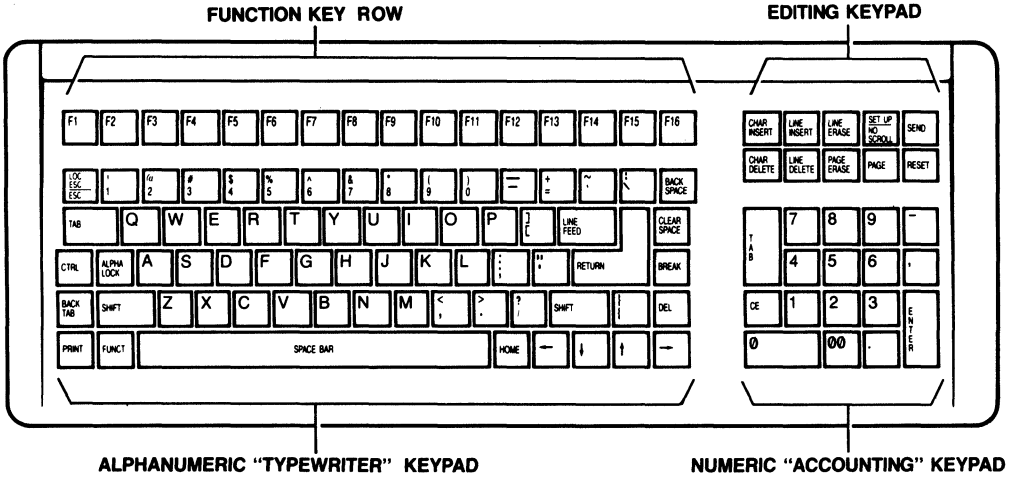
3. OPERATING THE 905

3. OPERATING THE 905

This chapter describes how to operate the 905, including details on the keyboard, editing, printing, resetting, and screen/cursor control.

Note that many of the functions described in this chapter can be changed by your application program. If a feature described here does not operate as expected, contact your system manager, consult the manuals for your computer and application program, or call your dealer or distributor.

THE KEYBOARD



The 905 Keyboard
Figure 3-1

The 905 keyboard has four keypad areas. The following sections briefly explain the keys in each keypad. See Appendix F for a detailed description of key operations.

Alphanumeric Keypad

This area of the keyboard is most similar to an ordinary typewriter keyboard. All the alphanumeric and most of the other keys here repeat when pressed for more than one-half second.

The arrow keys, HOME, TAB, BACK TAB, BACK SPACE, RETURN, and LINE FEED move the cursor. The section in this chapter called "Printing" explains the PRINT key.

The operation of most other keys--ESC, CLEAR SPACE, CTRL, BREAK, DEL, FUNCT--is usually determined by your application program. Check your computer or program manuals for the functions they assign these keys.

The Numeric Keypad

This area of the keyboard is an accounting-style keypad (note the 0 and 00 keys and the raised center on the 5 key). However, some programs may change the operation of these keys.

The TAB and ENTER keys work much the same as the TAB and RETURN keys on the alphanumeric keypad. Your application program usually controls the CE key.

The character and TAB keys repeat.

The Editing Keypad

This area contains six editing keys whose names describe what they do--CHAR INSERT means Character Insert, and so on. These and the PAGE key are usually controlled by your application program.

The SET UP key enables set up mode (described in Chapter 2). Press NO SCROLL to stop and start the flow of data coming in to the screen from the computer.

The SEND and RESET keys are explained later in this chapter in the sections "Sending Data to the Computer" and "Resetting the Terminal."

The Function Key Row

The function keys can be very useful to both programmers and operators. The terminal does not recognize their default codes (messages) as commands, so programmers can include the codes in a program for various special purposes.

The 16 function keys can send 32 separate codes, since pressing a key alone sends a code, and pressing the same key with SHIFT sends a different code.

But the unshifted function keys are *reprogrammable*; that is, the codes they send can be changed by the user. You can load any message or command you like into a function key, such as a password, logon sequence, access code, or frequently typed words and phrases. You can program the function keys yourself, or your application program may do it for you.

After you reprogram the keys, you can write the new key codes on the adhesive-backed bezel label that comes taped to the underside of the keyboard, and stick the label onto the keyboard above the function key row.

Turn back to Chapter 2 (following Table 2-5) for directions on programming the function keys at the keyboard.

The function keys do not repeat.

EDITING AND SENDING DATA

Review the manuals for your application program or computer for instructions on editing and sending data, since programs often control editing keys and operations. The following information is very general and may not apply to your environment. Chapter 5 contains more technical descriptions of terminal operations.

Communication and Editing Key Modes

Before trying to edit or send data, you should understand the 905 communication and editing key modes. You can change these modes in set up, but if you are unsure of which to use, don't change them. Your application program also often determines the editing and communication modes. See the troubleshooting suggestions in Chapter 4 if double characters or no characters at all appear when you enter data.

Full duplex: Most "interactive" application programs (those where you enter commands or data and the computer responds) work best with the 905 in full duplex communication mode. Your 905 is set for full duplex mode when it comes from the factory.

In full duplex, the terminal sends the key code only to the computer and not to the terminal. However, computers often "echo" key codes back to the terminal, so the printable characters you type appear on your screen, and special keys can control the terminal. But remember, your application program often changes how keys work.

Half duplex: If your computer does not echo key codes back to the terminal, you can set it for half duplex. Then the terminal sends key codes both to the computer and to the screen.

Block: Data you enter goes only to the screen until you send it to the computer by pressing the SEND key. However, the terminal can still receive any data the computer sends.

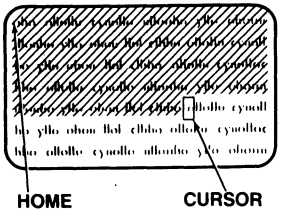
Editing key: Editing keys control editing operations and cursor movement. Appendix F lists the editing keys and explains more about them. Editing key mode affects most, but not all, editing keys. In *local* editing key mode, editing key codes go *only* to the screen, even when the terminal is in full or half duplex mode. In *duplex* editing mode, the editing key codes are handled the same as other characters you type--they go to the computer and/or the screen, depending on the communication mode.

Sending Data to the Computer

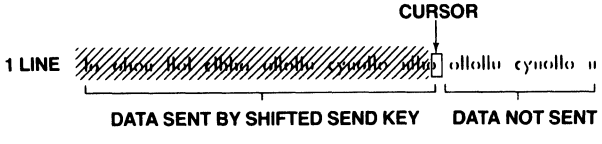
The SEND key sends screen data to the computer when the terminal is in block mode (explained in the previous section).

For a *page send*, press SEND. All data through the cursor position goes to the computer.

For a *line send*, press SHIFT-SEND. Data on the cursor line through the cursor goes to the computer.



Page Send



Line Send

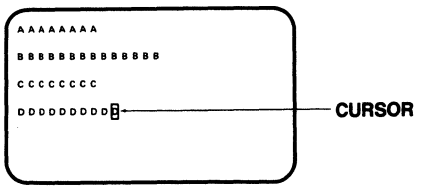
How the SEND Key Works
Figure 3-2

Printing

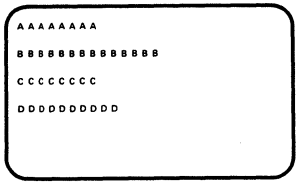
Pressing the PRINT key sends the screen display to a printer attached to the terminal. This is called a *page print.*

For a *formatted* page print, press PRINT. Each line sent to the printer ends with a carriage return and line feed.

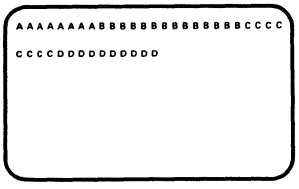
For an *unformatted* page print, press SHIFT-PRINT. Without formatting controls, the appearance of the printed output varies, depending on the amount of space characters the screen contains.



a. Screen Data



b. Formatted Page Print



c. Unformatted Page Print (Sample)

How the PRINT Key Works
Figure 3-3

During a page print, the screen does not accept new data from the computer or keyboard. When the page print finishes, data can again flow onto the screen.

If you have a problem with printing, see the troubleshooting suggestions in Chapter 4.

RESETTING THE TERMINAL

For a *full reset*, press CTRL-RESET. This has the same effect as turning the terminal off and back on again. All operating parameters return to the last values saved in permanent memory.

For a *partial reset*, press CTRL-SHIFT-BREAK. This disables write protect, protect, and the print mode; returns the terminal from block mode to the previous duplex communication mode; restores communication between the terminal and the computer (if previously halted); unlocks the keyboard; and sounds the bell.

SCREEN APPEARANCE

When you turn on the terminal, you see the *cursor* and the *status line.*

The Cursor

The cursor indicates the position of the next entered character. It can be steady or blinking, block or underline, or invisible. You select its appearance in set up.

The UP, LEFT, DOWN, RIGHT, TAB, BACK TAB, HOME, LINE FEED, RETURN, ENTER, and BACK SPACE keys move the cursor.

Screen Saver

If you enable the screen-saver feature in set up, the screen blanks after 15 minutes of inactivity. Blanking the screen conserves the phosphor coating inside the face of the screen. Any new data from the keyboard or host makes the display reappear.

The Status Line

In normal operation the status line appears at the bottom of the screen. It summarizes the current terminal operating characteristics. Most fields are normally blank; information appears only when appropriate.

Your application program may let you display a *user message* in place of the status line. Turning off or resetting the terminal erases the message.

Figure 3-4 shows a status line with only the default messages. Note the communication mode (FDX) in the 10th field. Appendix J explains all the status line messages that may appear.

The 905 Status Line
Figure 3-4

4. MAINTENANCE AND ASSISTANCE

4. MAINTENANCE AND ASSISTANCE

TROUBLESHOOTING

Your 905 terminal is engineered to provide years of service. Occasional problems are usually the result of some cause other than a fault in the terminal. If you have a problem with your 905, find the symptom in Table 4-1 and try the solution listed there before placing a service call. If you can't solve the problem yourself, call your dealer or distributor.

Troubleshooting Terminal Problems
Table 4-1

Symptom	Possible Solution
Terminal dead (no bell; no cursor)	Unplug power cord and plug in both ends again.
	Check the line fuse; replace if necessary (see the instructions in this chapter).
	Turn on power switch.
	Check the terminal voltage setting (on the shipping carton).
Terminal does not go on line	Make sure system is "up."
	Disconnect all cables and check for damage, then reattach.
	Reset the terminal.
	Make sure the terminal is not in block mode (check the set up menu).
	Check the main port set up line to see that terminal communication values match your computer communication format.

Troubleshooting Terminal Problems
Table 4-1 (continued)

Symptom	Possible Solution
Terminal does not go on line	Check computer port pin signals (see Appendix D). Ensure that pins 1, 2, 3, and 7 are connected as specified. Pins 5, 6, and 8 must be driven by +12 volt dc power or be disconnected.
	Turn on the modem.
	Connect a different modem.
	Check handset position in modem cradle.
Cursor does not appear	Adjust screen brightness.
	Check cursor style in set up.
Computer does not respond while on line	Set baud rate, parity, word structure, and stop bits to match computer requirements.
	Check cables connecting the terminal to th computer.
No keyboard response	Unplug and reattach both ends of keyboard cable.
	WARNING! Do not unplug the keyboard cable while the terminal is turned on. A power surge may result, which could severely damage the terminal.
	Try half duplex communication mode.
Keyboard locked up	Review all set up line values.
	Reset the terminal.

Troubleshooting Terminal Problems
Table 4-1 (continued)

Symptom	Possible Solution
Printer does not print correctly	Check communication values shown in the main and printer port set up menus against your computer and printer communication format. Are the communication, editing key and print modes set so the terminal receives the PRINT key codes and printing commands? Check that the cable connecting the terminal and printer is properly connected. Check printer port pin signals (see Appendix D). Ensure that pins 1, 2, 3, and 7 are connected as specified. Pins 4 and 20 must be driven by +12 volt dc power or disconnected.
Escape and control codes do not function as expected	Check escape sequences and control codes. Make sure upper- and lowercase letters are entered correctly. Is a one used instead of a lowercase L? Zero for uppercase O? Make sure the ALPHA LOCK key is not engaged. Disconnect the cable from the terminal main port and loop main port pins 2 and 3; try operating in full duplex. Try ESC sequences with LOC ESC key.
Display is wavy or bell sounds unusual	Change hertz setting.

Running the Self Test

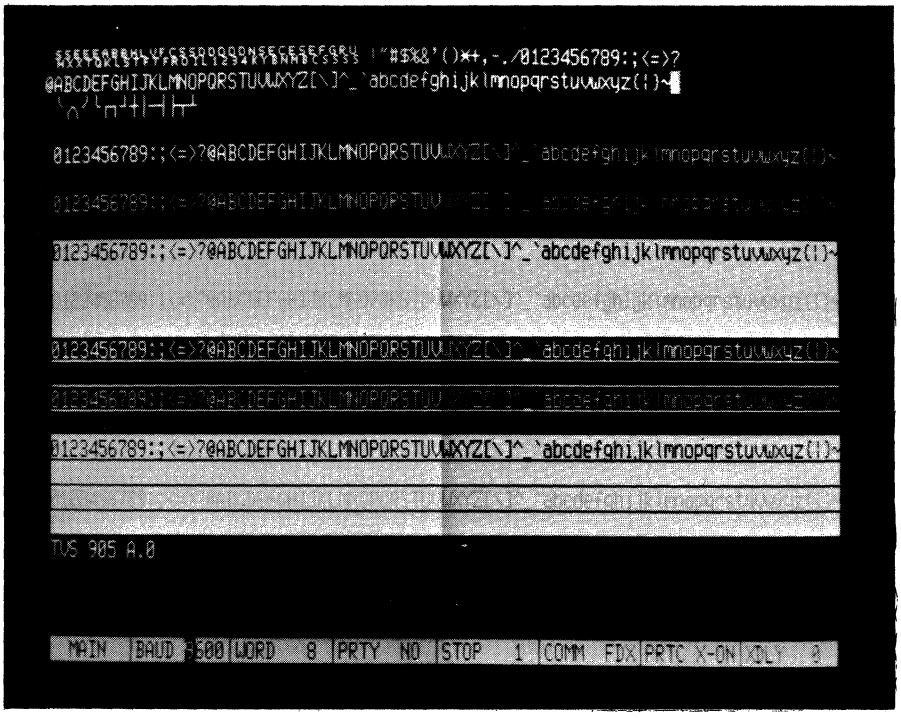
You can verify proper operation of the terminal video display circuitry by running the self test. The test shows all displayable characters and visual attributes.

NOTE: Running the self test erases any data on the screen.

1. Press (in sequence):

   SET UP 1

2. Watch for the test screen to appear.



The Self Test Screen
Figure 4-1

3. Check the screen:

   * Four lines should blink.
   * All characters (ASCII control and display; graphics) should be displayed.
   * Each character should be formed properly, with no extra or missing dots.
   * The screen should show all the visual attributes in both full and half intensity.
   * The firmware revision level should appear in the lower left corner.

4. Press SET UP to stop the test.

5. Press CLEAR SPACE to clear the test from the screen.

Checking and Replacing the Line Fuse

Figure 4-2 (next page) shows the terminal line fuse.

1. Turn off the power and unplug the terminal power cord from the wall outlet.

2. Remove the fuse holder by unscrewing it counterclockwise.

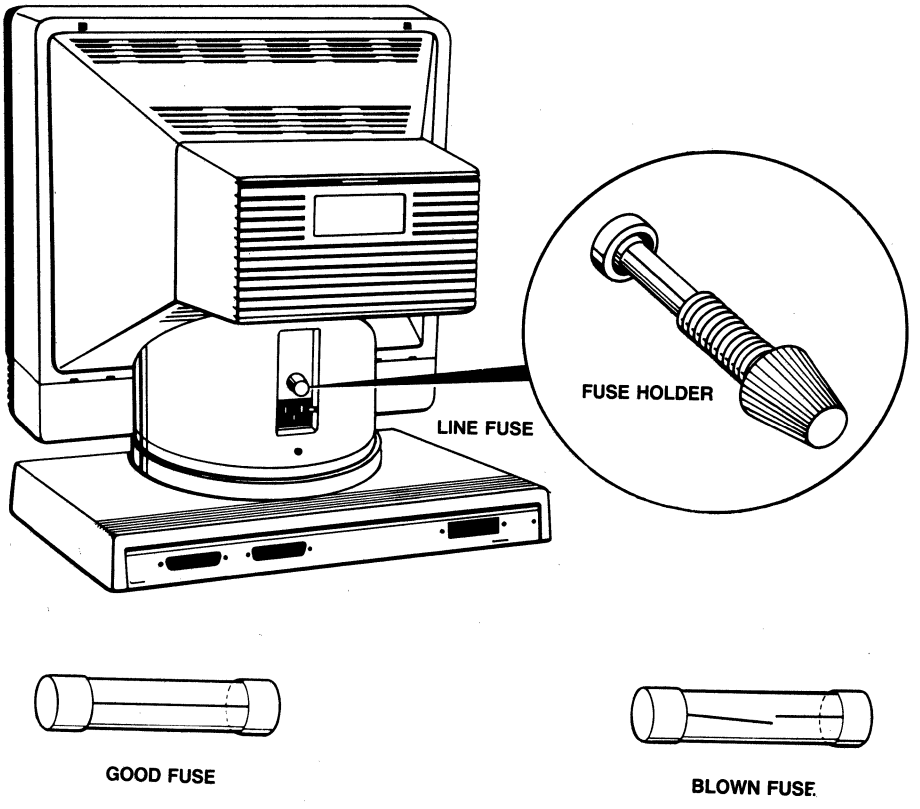
3. Slip the glass fuse out of the holder and examine it.

   If the thin wire inside the fuse is intact, the fuse should be functional. If the thin strip is broken and/or the glass is slightly black the fuse has blown and must be replaced. (A totally black fuse can indicate a problem with the power outlet. If that happens, call your service technician.)

4. Replace and tighten the fuse holder.

5. Plug in the terminal power cord.

If the newly replaced fuse blows out immediately, do not replace it again. Call your service technician.



Replacement fuse: 1.5-ampere slow-blow (110 volt)
0.75-ampere slow-blow (220 volt)

The Line Fuse
Figure 4-2

IF YOU NEED ASSISTANCE

Your TeleVideo dealer can help you solve problems and obtain service. Before calling your dealer, review the troubleshooting solutions listed in Table 4-1 and check the operating parameters (go back to Chapter 2 to review them). Try to place the terminal by the phone. Have the terminal serial number, found on the rear of the case, and this manual at hand.

Service Under Warranty

The terminal is covered by a limited warranty (see Appendix B). No warranty registration is required. If you need service during the warranty period, call your dealer. Should you need to ship the terminal to the factory for repair, ask your dealer to first contact TeleVideo and secure a Return Material Authorization.

Shipping the Terminal

Have your service technician check the integrity of the cabling and the security of the internal mounting hardware. Repack the terminal, using either the original TeleVideo shipping container or other suitable materials.

5. PROGRAMMING THE 905

Programming

5. PROGRAMMING THE 905

The 905 command set is compatible with the TeleVideo model 925 code set. It contains additional commands that control the added features of the 905, and has omitted some unnecessary 925 commands. Other programming modes (selected in set up) are compatible with TeleVideo 910, Hazeltine 1410 and 1500, Lear Siegler ADM-3A/5, Qume QVT-101, and ADDS Viewpoint A2 and Regent 25 code sets.

This chapter describes the operation of the 905 command set. Appendix G lists all code sets, and Appendix F lists the codes transmitted by the editing keys in each mode.

Most reprogrammed operating values are not saved in nonvolatile memory (exceptions, such as function keys and page print termination character, are noted in their descriptions). Resetting the terminal destroys the reprogramming.

Some reprogrammable operating values, however, can also be changed in set up (the section called "Command Format" tells how to identify these values). When you change a set up value with a programming command, the set up line reflects the change. If you then enter set up and save the set up line values, the reprogrammed value is stored in nonvolatile memory.

NOTE: It's often convenient to change an operating feature by commanding the terminal directly (locally) from the keyboard. If you are not experienced in sending commands locally, read the subsection called "Entering Commands From the Keyboard" in the following section.

ENTERING COMMANDS

The terminal responds to commands sent from the host or entered at the keyboard.

When you enter commands from the keyboard, use the LOC ESC key instead of ESC, or put the terminal into block communication mode.

Sending Commands From the Host

The 905 terminal responds to control codes and escape sequences from the host regardless of your programming language format and syntax. How you incorporate commands into your programs depends on your programming language.

The multitude of languages and syntaxes recognized by each language makes it impossible to show you in this manual how to incorporate commands in each program. If you need help with the proper syntax, refer to the documentation for your programming language.

The Appendix C shows the ASCII characters and corresponding numeric values in various systems.

Entering Commands From the Keyboard

Sending programming commands from the keyboard lets an operator control many aspects of terminal operation not available in set up. Two factors affect the terminal response to commands from the keyboard:

* Communication mode

* Correct keystrokes

Communication mode To ensure that commands from the keyboard go to the terminal, enable block communication mode. If you enter commands at the keyboard during full or half duplex communication mode, the results are unpredictable. The computer receives the commands, and its response depends on its application program.

However, you can send escape sequences to the terminal during full or half duplex mode by entering the commands with the LOC ESC key instead of ESC. This sends commands to the terminal only.

Correct keystrokes Always press the CTRL key first and *hold it down* while you press the other key (as you would the SHIFT key). Always press *and release* the ESC key before pressing the next key.

Enter characters exactly as shown. Notice whether the command requires an upper- or lowercase character, a number **one** or a lowercase **L**, a **zero** or an uppercase **O**. Make sure the ALPHA LOCK key is not locked.

Commands are printed in this manual with a space between the characters. Do *not* type this space as part of the sequence; it is included only for clarity. For example, the sequence

ESC c

involves pressing only the ESC key followed by a lowercase c.

Command Format

This manual presents programming commands in a format that shows the section title, values selectable in set up, default values, the command function, the command in ASCII characters, and the equivalent key (if any). Of course, no one command has all these elements.

For example, look at the command to change the cursor style:

Cursor Style	**SET UP** **DEFAULT Ps = 1**
Select cursor style	**ESC . Ps**

Cursor Style is the title of the section. Each section contains one or more commands. All the commands that affect one terminal function are grouped under a section title, listed in the table of contents.

SET UP indicates that the function or value can also be selected in set up.

DEFAULT Ps = 1 gives the default terminal condition.

Select cursor style defines the function of the command.

ESC . Ps is the command in ASCII characters. Variables in commands are usually shown as **Pn** or **Ps**. Pn represents a decimal value and Ps a selective value. Variable choices and their effects are listed in the descriptive text following each command.

The sixth element (not shown in the above example) is the keyboard key that sends the command code. For example, the command

Move the cursor right	**CTRL L** **key RIGHT**

means the right arrow key sends the code CTRL L.

VERIFYING OPERATIONS

Self Test

Run the self test **ESC V**

This command starts the self test described in Chapter 4. After you run the test, pressing the CLEAR SPACE key or sending a clear command clears the screen.

NOTE: Depending on your communication mode, you may want to run the test and clear the screen from the keyboard, entering the commands with the LOC ESC key.

Monitor Mode

DEFAULT = Off

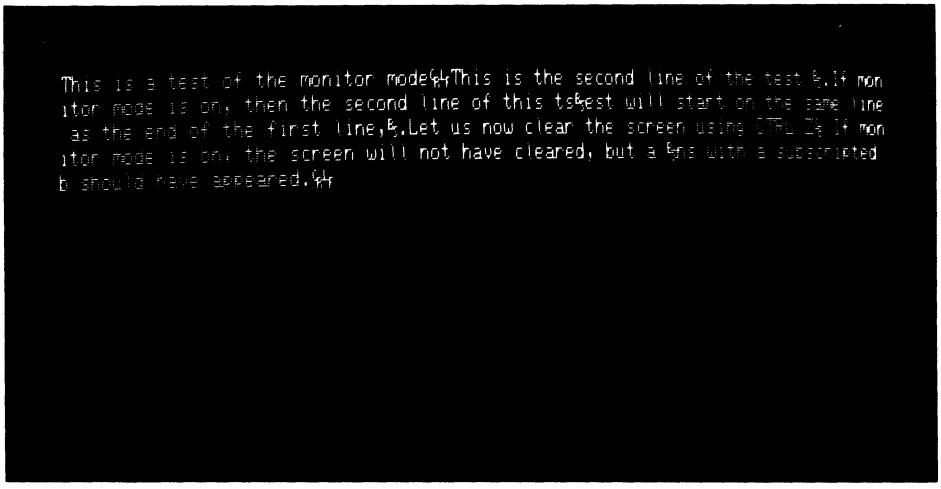
Monitor mode on **ESC U**
Monitor mode off **ESC X**
ESC u

Mode on The terminal displays commands (control and escape sequence characters) on the screen, instead of acting on them.

Mode off Terminal processes commands normally.

Figure 5-1 shows a typical monitor mode display. Seeing command characters on the screen can help you debug a program. Appendix C shows how control characters appear on the screen in monitor mode.

If you want to display a control character without putting the terminal in monitor mode, send an escape character (or press LOC ESC) just before the control character.



Typical Monitor Mode Display
Figure 5-1

RESETTING THE TERMINAL

Reset terminal operating values to factory default values	**ESC ~ 0**
Reset terminal operating values to nonvolatile memory values	**ESC ~ 1** **key CTRL-RESET**
Reset function keys to factory default values	**ESC ~ 2**

STOP! The ESC ~ 0 command erases any reprogramming you may have loaded into nonvolatile memory.

These commands void any values previously changed by commands from the keyboard or computer.

Table 5-1 summarizes methods for resetting some or all terminal operating values. Be careful when you reset the terminal: You can lose operating values you have reprogrammed or selected in set up.
Summary of Reset Methods
Table 5-1

Summary of Reset Methods
Table 5-1

Command/ Key Sequence	Clears Screen?	Effects
ESC ~ 0	Yes	Resets software and returns non-volatile memory to factory default values.
STOP! This sequence permanently destroys any reprogrammed values in nonvolatile memory.		
CTRL-RESET or ESC ~ 1 or power off and back on	Yes	Returns the terminal to nonvolatile memory values (including latest set up line values and reprogrammed function keys). Unlocks the keyboard.
ESC ~ 2	No	Restores codes sent by function keys to factory default values.
CTRL-SHIFT-BREAK	No	Turns off print, write protect, and protect modes. Returns the terminal from block mode to the previous conversational mode. Restores communication between terminal and host (if previously halted). Unlocks the keyboard and sounds the bell.
CTRL-BREAK	No	Sends a *break* signal, which brings the transmit data line to a space (low) condition for 250 milliseconds. Has no effect on screen display and does not reset any operating values. Can disconnect a modem.

KEYBOARD AND BELL

Locking/Unlocking the Keyboard

	DEFAULT = Unlock
Lock (disable) the keyboard	**ESC #**
Unlock (enable) the keyboard	**ESC "**

Keyboard locked Only the FUNCT, LOC ESC, BREAK, SET UP, RESET, and NO SCROLL keys operate.

Unlock keyboard Reset the terminal: Press CTRL-SHIFT-BREAK, CTRL-RESET or LOC ESC ", or turn the power off and back on. See Table 5-1 for other effects of these resets.

Editing Key Mode	**SET UP** **DEFAULT = Duplex**
Enable local editing key mode	**ESC k**
Enable duplex editing key mode	**ESC *l***

Duplex mode The communication mode determines the destination of all key codes.

Local mode Even in a conversational communication mode, codes from the following keys act locally (go to the screen only):

UP	TAB (main)	PAGE	LINE ERASE
DOWN	TAB (kypad)	CE	PAGE ERASE
RIGHT	BACK TAB	ENTER	CLEAR SPACE
LEFT	LINE INSERT	PRINT	CHAR INSERT
HOME	LINE DELETE	SEND	CHAR DELETE

Keyclick	**SET UP** **DEFAULT = On**
Keyclick on	**ESC >**
Keyclick off	**ESC <**

Sounding the Bell

Sound the terminal bell	**CTRL G**

SCREEN APPEARANCE

Screen display commands select the the color (light or dark) of the screen, the character set, the cursor style, and the visual attributes (the appearance of characters on the screen).

Screen Visibility

	DEFAULT = On
Turn screen on	**ESC n**
Turn screen off	**ESC o**

Turning the screen off does not clear the display.

Screen Background	**SET UP**
	DEFAULT = Dark
Light background with dark characters	**ESC b**
Dark background with light characters	**ESC d**

The effect of the screen background command depends on the background chosen in set up. If the terminal receives a command to enable the current background, no change occurs.

Cursor Style	**SET UP**
	DEFAULT Ps = 1
Select cursor style	**ESC . Ps**

Ps	Cursor Style
0	Cursor not displayed
1	Blinking block cursor
2	Steady block cursor
3	Blinking underline cursor
4	Steady underline cursor

This command remains in effect until you change it with another command or change the set up line.

Visual Attributes

DEFAULT Ps = 0

Define visual attribute(s) **ESC G Ps**

Ps	Visual Attribute
0	Normal (default) video
1	Invisible normal video
2	Blink
3	Invisible blink
4	Reverse current background
5	Invisible reverse
6	Reverse and blink
7	Invisible reverse and blink
8	Underline
9	Invisible underline
:	Underline and blink
;	Invisible underline and blink
<	Reverse and underline
=	Invisible reverse and underline
>	Reverse and underline and blink
?	Invisible reverse and underline and blink

Visual attributes are embedded, write-protected characters. They appear in half intensity. Entering a character in an attribute position can write over (destroy) the attribute. To safeguard attributes, enable protect mode (described in the next section) when entering data.

Attributes are field based. The attribute field ends at one of following conditions:

* Enabling another attribute.

* The end of the line or bottom of the screen. Attribute base mode, selected in set up, determines the attribute field.

To set a visual attribute, place the cursor one position before you want the attribute to start, then enter the correct escape sequence.

Table 5-2 describes the effects of visual attributes.

Effects of Visual Attributes
Table 5-2

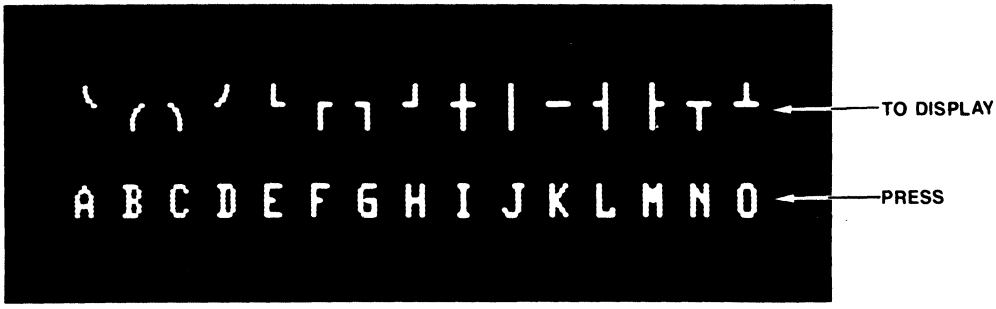
Name	Effect
Normal	Restores background of screen to value in set up line (either dark or light).
Reverse	Changes screen background to reverse of current background. If screen background was dark with light characters, it is now light with dark characters.
Underline	Creates a solid line below character(s).
Blink	Causes character(s) to blink.
Invisible	Makes all subsequent data entered invisible (although cursor is still visible and data is transmitted to computer). Often used to enter a password, payroll, or other sensitive information.

Special Graphics Mode

	DEFAULT = Off
Special graphics mode on	**ESC $**
Special graphics mode off	**ESC %**

Graphics mode on The terminal converts alphanumeric characters to 16 special graphics characters compatible with the 950 terminal graphics characters. Figure 5-2 shows 15 of the 16 characters and the keys you press to produce them. (The other character is a space, which occupies a position but is not visible.)

Graphics characters are write protected. The next section, "Editing Modes," describes write-protected characters.



Special Graphics Characters
Figure 5-2

EDITING MODES

Editing modes affect the action of many editing commands, some of which can cause loss of data. If you are unsure about the setting of a mode or the effect of a command, experiment on data you don't mind losing.

Write Protect and Protect Modes

	DEFAULT = Off
Enable write protect (half-intensity) mode	**ESC)**
Disable write protect (half-intensity) mode	**ESC (**
Enable protect mode	**ESC &**
Disable protect mode	**ESC '**

While write protect mode is enabled, any data then entered is *write protected.* When you later enable protect mode, only certain commands can edit and transmit write-protected characters.

All write-protected characters (data, graphics, attributes) appear in half intensity.

NOTE: Turn write protect mode *off* before you change the terminal compatibility mode (in set up).

Protect mode guards all write-protected characters on the screen. Cursor position when you enable protect mode is irrelevant.

Table 5-3 describes the effects of protect mode. The procedure for entering write-protected data and enabling protect mode follows.

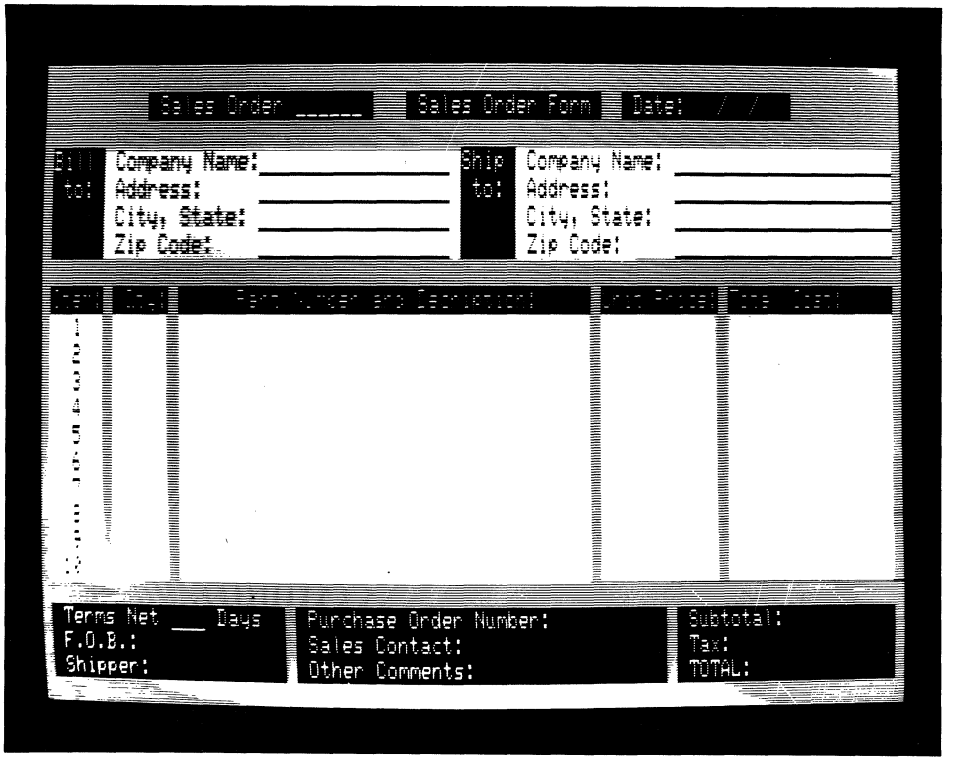
Effects of Protect Mode
Table 5-3

Function	Effect
Data entry	The cursor skips over protected fields during data entry.
Cursor movement	Cursor movement commands cannot cause protected *or unprotected* data to scroll off the screen. Cursor up and down commands can move the cursor into a protected field but cursor right and left commands cause the cursor to skip over a protected field.
Tabulation	The first unprotected position after a protected field becomes a field tab stop. Pressing the TAB key or sending a tab command moves the cursor to the first field tab stop following a protected field.
Editing	Most editing commands affect only unprotected data. Only some clear commands (see the section titled "Clearing Data") can affect protected data.
Block transmission	Only specific send commands transmit protected characters.

Creating a Protected Form

Using write protect and protect modes, you can create forms with permanent (protected) headings and blank areas for an operator to fill in later. Protecting the headings keeps them from being accidentally deleted or changed.

Figure 5-3 shows a typical form with protected areas.



Sample Form With Protected Headings
Figure 5-3

Creating protected data, such as a form, takes two steps:

* Turn on *write protect* mode and enter the data you want to protect.

* Turn on *protect mode* to guard the write-protected data.

Follow the steps below to enter protected data:

1. Position the cursor where you want to enter the first protected character.

2. Enter

   ESC)

   to enable write protect mode.

3. Enter the information you want to protect.

   NOTE: Unlike visual attributes, the write protect attribute is character based. Bracketing existing data with the commands to enable and disable write protect mode does not write protect the field. To write protect existing data, you must enable write protect mode, then retype the desired characters.

4. Enter

   ESC (

   to turn off write protect mode.

5. After entering all data you want to protect and disabling write protect mode, turn on protect mode. All write-protected areas are now protected.

Autoscroll Mode	**SET UP** **DEFAULT = On**
Autoscroll mode off	**ESC v**
Autoscroll mode on	**ESC w**

Autoscroll off The cursor does not wrap to a new line when you enter data at the last position on the screen. Line feed and cursor movement commands cannot scroll data off the screen.

Autoscroll on When protect mode is disabled, data entry from the computer or keyboard, as well as certain editing keys and commands, can scroll data off the screen, resulting in a loss of data. Table 5-4 lists the keys and commands, and Figure 5-4 illustrates data loss from scrolling. *To prevent loss of data, enable protect mode.*

Causes of Data Loss in Autoscroll Mode
Table 5-4

Command	Key	Function
CTRL J	LINE FEED SHIFT-DOWN	Line feed
ESC j	SHIFT-UP	Reverse line feed
CTRL L	RIGHT	Cursor right
--	Alphanumeric	Data entry from host or keyboard

Data Loss During Scrolling
Figure 5-4

CURSOR CONTROL

Many cursor movements are affected by protect and autoscroll modes. The tables that follow each set of commands explain how they are affected.

Line Feed and Reverse Line Feed

Line feed	**CTRL J**
	key LINE FEED
	key SHIFT-DOWN[1]
	key DOWN[1]
Reverse line feed	**ESC j**
	key SHIFT-UP

A line feed moves the cursor down one line in the same column. A reverse line feed moves it up. Tables 5-5 and 5-6 summarize how autoscroll and protect modes affect vertical cursor wrap after a line feed or reverse line feed command.

STOP! Under certain conditions, line feed and reverse line feed may result in the loss of data. These conditions are described in the following tables.

---

[1]Depends on selection of DOWN key mode in set up.

Cursor Movement After a Line Feed Command
Table 5-5

Modes		
Auto-scroll	**Pro-tect**	**Effect**
On	On	If the cursor is at the bottom of the screen, it wraps around to the top line.
	Off	If the cursor is at the bottom of the screen, the display scrolls up one line. The top line is lost, and a new bottom line of space characters appears.
Off	On/Off	When the cursor reaches the last line, it wraps around to the first line.

Cursor Movement After a Reverse Line Feed Command
Table 5-6

Modes		
Auto-scroll	**Pro-tect**	**Effect**
On	On	When the cursor reaches the top line, it does not move any farther.
	Off	When the cursor reaches the top line, data scrolls down. A new top line filled with space characters appears, and the old bottom line is lost.
Off	On/Off	When the cursor reaches the first line of the screen, it does not move.

Cursor Movement

Move the cursor up	**CTRL K**
	key UP
Move the cursor down	**CTRL V**
	key DOWN[1]
Move the cursor right	**CTRL L**
	key RIGHT
Move the cursor left (back space)	**CTRL H**
	key LEFT
	key BACK SPACE
New line (line feed/carriage return)	**CTRL _**
Carriage return	**CTRL M**
	key RETURN
	key ENTER

The cursor right and left commands move the cursor over a protected field; the cursor up and down commands do not.

When autowrap mode is disabled (in set up), the cursor right and cursor left commands do not wrap the cursor from its current line to the next or previous line, regardless of the setting of autoscroll and protect modes.

The cursor right command can cause data to scroll off the screen under certain circumstances, as shown in Table 5-7.

---

[1]If CTRL V code for DOWN key is selected in set up.

Effect of the Cursor Right Command
Table 5-7

Modes			
Auto-wrap	**Auto-scroll**	**Pro-tect**	**Effect**
On	On	Off	If the cursor is on the last column of the last line, data scrolls up one line. The first line is lost, and a new bottom line of space characters appears.
	On/Off	On	If the cursor is on the last unprotected position, it wraps around to the first unprotected position.
Off	On/Off	On/Off	If the cursor is on the last unprotected position, it stops.

Addressing the Cursor

Address (send) cursor to row and column ESC = r c

r = An ASCII character from the cursor coordinate table (Appendix E) for the row (line).

c = An ASCII character from Appendix E for the column.

These commands, called *addressing* or *loading* the cursor, let the computer move the cursor to a specific location in terminal memory.

NOTE: If your computer inserts nulls between characters, addressing the cursor moves it to an unpredictable position.

For example,

ESC = (Q

sends the cursor to row 9, column 50.

Reading the Cursor

Read cursor row and column position **ESC ?**

These commands tell the terminal to report (i.e., read) the current cursor position to the computer.

The terminal responds with ASCII characters from Appendix E representing row and column, followed by a carriage return character.

For example, the terminal would respond to the command

ESC ?

from the computer with

(Q CR

to indicate the cursor position is row 9, column 50.

Cursor Home

Move cursor to home position **CTRL ^**
key HOME

This command moves the cursor to the first unprotected screen position (usually home position, row 1 and column 1). It has no effect if the cursor is already there.

TAB STOPS

The terminal has two types of tab stops:

* Typewriter (recognized only when protect mode is off)

* Field (recognized only when protect mode is on)

Setting Tab Stops

Set field (protect mode on) or typewriter (protect mode off) tab stops	**ESC 1** **key SHIFT-TAB[1]**

STOP! This command can destroy data during protect mode.

Turning protect mode on automatically sets field tab stops at the first unprotected position after each protected field.

Sending ESC 1 during protect mode creates a column of protected space characters at the cursor position, *destroying the characters that occupy that column.* The column extends down from the cursor line until it encounters a protected character.

The first unprotected position *after* the protected space character in each line becomes a field tab stop. See Figure 5-5.

The cursor moves from the new protected space character to the new field tab stop.

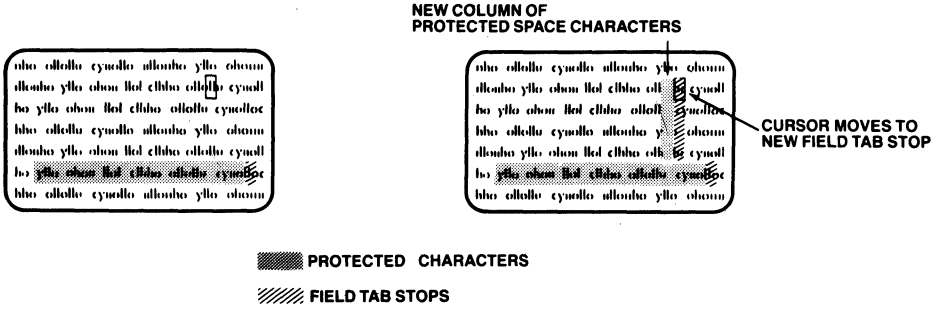
After protect mode is turned off, the protected column remains as write-protected space characters.

When protect mode is off, sending ESC 1 creates a tab stop in every line on the screen *at the current column position.*

Be sure you enter a number one in the command. A lowercase L turns on duplex edit mode.

---

[1]Main keypad only.



Setting Field Tab Stops
Figure 5-5

Clearing Tab Stop(s)

Clear typewriter tab stop at cursor location	**ESC 2** **key SHIFT-BACK TAB**
Clear all typewriter tab stops	**ESC 3** **key SHIFT-CE**

The cursor position is irrelevant when you clear all typewriter tab stops.

Turning protect mode off automatically clears field tab stops. Turning it on again automatically resets them.

Moving the Cursor to a Tab Stop

Move cursor forward to next typewriter or field tab stop	**CTRL I** **key TAB**
Move cursor forward to next field tab stop (protect mode on)	**ESC i**
Move cursor backward to previous typewriter or field tab stop	**ESC I** **key BACK TAB**

All tabulation commands are affected by protect mode, as described in Table 5-8.

Effect of Protect Mode on Tabulation Commands
Table 5-8

Command	Protect Mode	Effect
Tab forward (CTRL I)	Off	Moves the cursor to the next typewriter tab stop. If no more tab stops exist, the cursor does not move.
	On	Moves the cursor to the first position in the next unprotected field (next field tab stop). If the screen has no more unprotected fields, the cursor returns to the first unprotected position.
Tab backward (ESC I)	Off	Moves the cursor back to the previous typewriter tab stop. If the cursor is already on the first tab position on the line, or if no other tabs stops exist, the cursor moves to the first column of the line.
Tab backward (ESC I)	On	Moves the cursor back to the first position in the current or previous unprotected field. If the screen has no previous unprotected positions, the cursor does not move.

EDITING DATA

You can edit data in five ways:

* Insert character(s)
* Write over existing characters
* Delete characters
* Erase characters
* Clear characters

Inserting Data

Insert a space character at the cursor position	**ESC Q** **key CHAR INSERT**
Insert a line of space characters on the current line	**ESC E** **key LINE INSERT**

Table 5-9 describes how protect mode affects the action of insert commands.

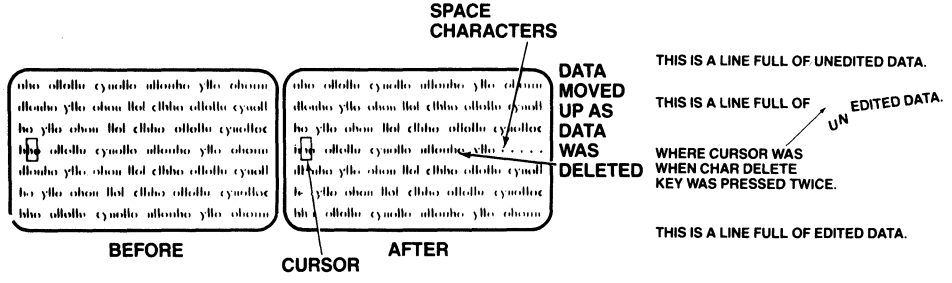
Effect of Protect Mode on Insert Commands
Table 5-9

Command	Protect Mode	Effect
Insert character (ESC Q)	Off	Enters a space character at the cursor position and moves existing characters right Data pushed past end of the line is lost.
	On	Same as above, but only unprotected characters in the current field move. Characters reaching the first protected position or the end of the line (whichever comes first) are lost.
Insert line (ESC E)	Off	Inserts a line of space characters starting at the current line; moves all following lines down. Cursor moves to start of the first inserted line. Lines pushed off the screen are lost.
	On	No action.

Deleting Data

Delete character at cursor position	**ESC W** **key CHAR DELETE**
Delete current line and replace with space characters	**ESC R** **key LINE DELETE**

Deleting *removes* unprotected data only, starting at the cursor position, and pulls the remaining characters back to the cursor position. Space characters appear at the end of the line or the screen. Figure 5-6 shows how data is deleted in a line, and Table 5-10 describes the effects of protect mode on delete commands.



Deleting Data
Figure 5-6

Effect of Protect Mode on Delete Commands
Table 5-10

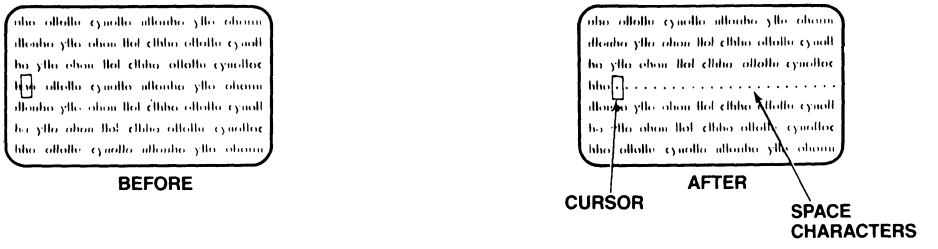
Command	Protect Mode	Effect
Delete a character (ESC W)	Off	Deletes character(s) starting at the cursor; pulls the following characters left.
	On	Same as protect off except only unprotected characters are deleted.
Delete a line (ESC R)	Off	Deletes line(s) starting at the cursor line and moves remaining lines up. Moves the cursor up a line and back to the first position.
	On	No action.

Erasing Data

Erase unprotected characters from the cursor to end of line; replace with space characters	**ESC T** **key LINE ERASE**
Erase unprotected characters from the cursor to end of line; replace with null characters	**ESC t** **key SHIFT-LINE ERASE**
Erase unprotected characters from the cursor to end of screen; replace with space characters	**ESC Y** **key PAGE ERASE**
Erase unprotected characters from the cursor to end of screen; replace with null characters	**ESC y** **key SHIFT-PAGE ERASE**

Erasing *replaces* only unprotected characters with null or space characters, as shown in Figure 5-7. The cursor and existing data do not move.

NOTE: Write protected characters are not protected until you enable protect mode. To avoid losing write protected data, enable protect mode before sending an erase command.



Erasing Data
Figure 5-7

Clearing Data

Clear current unprotected tab field and and replace with space characters; return cursor to beginning of field	**CTRL X** **key CE**
Clear all characters and replace with null characters (disable protect and write protect modes)	**ESC *** **key SHIFT-CLEAR SPACE**
Clear unprotected characters and replace with write protected space characters (disable protect mode)	**ESC ,**
Clear unprotected characters and replace with space characters	**ESC ;** **ESC +** **CTRL Z** **key CLEAR SPACE**
Clear unprotected characters and replace with null characters	**ESC :**

Clearing *replaces* data with space or null characters. Unlike erasing and deleting, clear commands (except CTRL X) do not relate to the cursor position; what you clear depends only on the command you give or the key you press.

All clear commands except CTRL X move the cursor to home or the first unprotected position.

Enabling protect mode affects the clear field command, CTRL X:

Protect mode off CTRL X clears all characters in the cursor tab field (or the line, if no tab stops are set) to space characters. The cursor moves to the beginning of the field (or line).

Protect mode on CTRL X clears the unprotected characters in the cursor field to space characters. The cursor moves to the beginning of that field.

COMMUNICATING WITH THE COMPUTER

You can reprogram the main port handshaking protocol and communication mode.

Selecting a Handshaking Protocol	**SET UP** **DEFAULT = X-On**
Disable X-On/X-Off; enable DTR line	**CTRL N**
Enable X-On/X-Off; disable DTR line	**CTRL O**

Sometimes the computer sends data faster than the terminal or its printer can receive it. Without a *handshaking protocol* between computer and terminal, data could be lost. The 905 uses X-On/X-Off or Data Terminal Ready (DTR) protocols.

The main port 256-character receive buffer holds data received from the host. If you enable X-On/X-Off, the terminal sends the ASCII character CTRL S (X-Off) to the computer, signalling it to stop sending data, when the buffer reaches its fill limit.

When the buffer empties to only 16 characters, the terminal sends CTRL Q (X-On), telling the host to resume data transmission. While X-On/X-Off is enabled, voltage on the DTR line remains high.

Disabling X-On/X-Off automatically enables the DTR protocol. Voltage on the DTR line drops when the receive buffer reaches its fill limit. When the receive buffer empties to 16 characters, the terminal raises voltage on the DTR line and the computer resumes sending data.

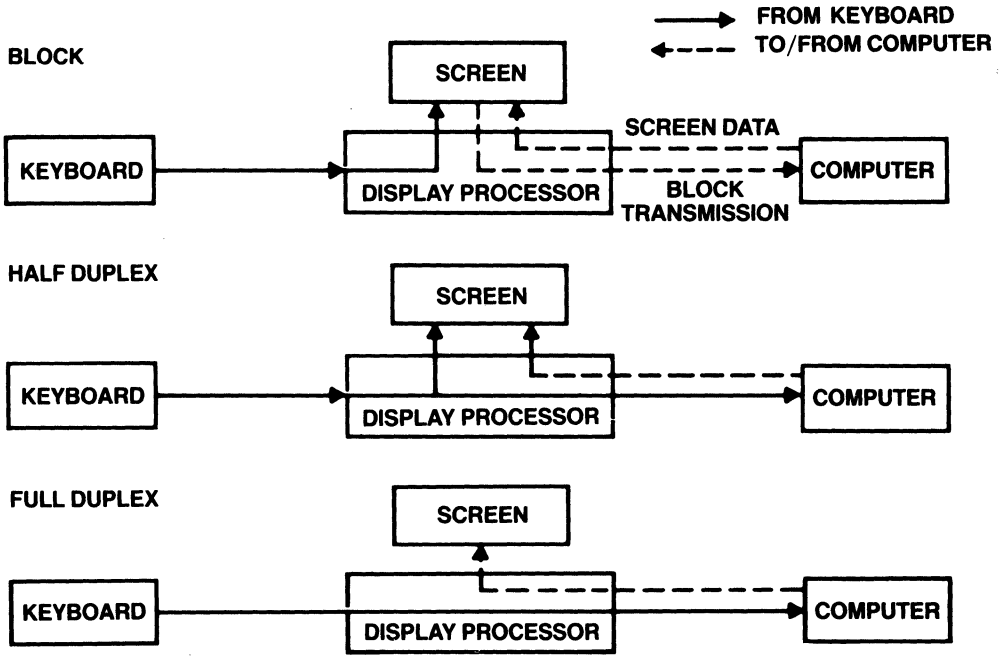
Communication Modes

Communication modes determine when and where data from the keyboard goes and how interaction with the computer takes place. You can change the current communication mode in set up or with a programming command.

The 905 has three communication modes:

Block
Half duplex (conversational)
Full duplex (conversational)

Figure 5-8 shows how data flows in each mode, and Table 5-11 describes each communication mode.



Data Flow in Communication Modes
Figure 5-8

Communication Modes
Table 5-11

Name	Effect
Block	In block mode the terminal first sends data only to the screen, so you can edit it before sending it to the computer. Block mode sends data faster than the conversational modes because the terminal transmits faster than you can enter data on the keyboard. The terminal can receive data from the computer during block mode.
Half duplex	The terminal sends keyboard entries to the screen and to the computer at the same time. Although it is a conversational mode, the terminal cannot transmit and receive simultaneously.
Full duplex	The terminal sends keyboard entries only to the computer. If the computer is programmed to act on a code generated by a keyboard entry, it may echo the result back to the terminal. The terminal can transmit and receive simultaneously.

Setting the Communication Mode	**SET UP** **DEFAULT = FDX**
Block mode on	**ESC B**
Return to previous conversational mode (half or full duplex) from block mode	**ESC C**

These commands let you move from one communication mode to another while running a program. The terminal returns to the communication mode selected in set up after a reset.

SENDING SCREEN DATA IN BLOCK MODE

Sending data to the computer is a separate step during block mode. You either press the SEND key or enter an escape sequence. Delimiters and text markers (explained in the following sections) define the data passages you send.

Delimiters

The terminal automatically inserts delimiters when it transmits text to tell the computer how much data it has sent (a field, a line, or the entire transmission).

The control characters listed in Table 5-12 are the default delimiters. If you don't want these characters in your transmissions, you can reprogram them with the commands in the next section.

NOTE: The terminal does not transmit the nulls in the delimiter codes to the computer.

Default Delimiter Values
Table 5-12

Delimiter	ASCII Character	Byte Value (in hex)
Field separator	FS NUL	1C 00
Start protect field	ESC)	1B 29
End protect field	ESC (	1B 28
End of line	US NUL	1F 00
Termination	CR NUL	0D 00

Reprogramming Delimiters

Reprogram delimiter characters **ESC x Ps p1 p2**

Ps	Delimiter
1	End of line
4	Termination

p1/p2 = Any ASCII characters

This command changes the end-of-line and termination delimiters included when the terminal sends screen data.

If you don't want any delimiters, program p1 and p2 as null characters. The terminal does not send null characters to the host in a delimiter.

Text Markers

You can define the text passages you want to send to the computer by including a start-of-text (STX) character where you want data transmission to begin and an end-of-text (ETX) character where you want it to stop. Because these markers are ASCII control characters, they occupy a character position. To insert the characters, put the the terminal in monitor mode or enter ESC CTRL B (for STX) or ESC CTRL C (for ETX).

Sending Data

Send unprotected characters in cursor line up to and including cursor	**ESC 4**
Send unprotected screen up to and including cursor	**ESC 5**
Send entire line of data up to and including cursor	**ESC 6** **key SHIFT-SEND**
Send entire screen up to and including cursor	**ESC 7** **key SEND**
Send unprotected data between STX[1] and ETX[2] characters	**ESC S**
Send all data between STX[1] and ETX[2] characters	**ESC s**

These commands define the quantity and type of data sent to the computer. If the data contains more than one set of STX and ETX characters, the STX character above and nearest the cursor and the following ETX character define what goes to the computer.

Table 5-13 describes the effect of send commands. Turn back to Table 5-12 for default delimiter values.

---

[1]If no STX character is present, data starts at home position.

[2]If no ETX character is present, data ends at screen's last position.

Send Commands
Table 5-13

Command	Effect
Send unprotected line (ESC 4)	Sends all unprotected data on the line between and including column one and the cursor. **Delimiters**--Sends a field separator in place of each protected field and a termination character after the transmission.
Send unprotected screen (ESC 5)	Sends unprotected data between and including the first unprotected position and the cursor. **Delimiters**--Sends a field separator for each protected field, line delimiter after each line, and a termination character after the transmission.
Send entire line (ESC 6)	Sends all data between and including first and cursor positions. **Delimiters**--Sends a termination character after the transmission. Brackets protected fields with start and end protected field delimiters.[1]
Send entire screen (ESC 7)	Sends all data between and including home and cursor positions. **Delimiters**--Sends line delimiter after each line and a termination character after the transmission. Brackets protected fields with start and end protected field delimiters.[1]

[1]When protect mode is on, a field of graphics characters is bracketed by ESC $ and ESC %, and the terminal sends ESC G Ps for visual attributes.

Send Commands
Table 5-13 (continued)

Command	Effect
Send unprotected passage (ESC S)	Sends all unprotected data between either STX character (if the cursor follows an STX character) or first unprotected position (if the cursor is before the STX character) and ETX character. Cursor moves to ETX character. If the screen has no STX character, sends all unprotected characters starting at the first unprotected position and continuing until the ETX character. Moves cursor to ETX character. If the screen has no ETX character, sends all unprotected data between either the STX character (if cursor follows STX character) or the first unprotected position (if the cursor is before the STX character) and the end of the screen. Moves the cursor to the first unprotected position. If the screen has no STX or ETX characters, sends all unprotected data. **Delimiters**--Sends a field separator in place of each protected field, line delimiter after each line, and a termination character after the transmission.

Send Commands
Table 5-13 (continued)

Command	Effect
Send entire passage (ESC s)	Sends all data between the STX character (if the cursor follows the STX character) or home (if the screen lacks an STX character or the cursor is before the STX character) and the ETX character. Moves the cursor to the ETX character. If screen has no ETX character, the terminal sends all data between either the STX character (if the cursor follows the STX character) or home (if the cursor is before the STX character) and the end of the screen. Moves the cursor to the home or first unprotected position. If screen has no STX or ETX character, sends everything. Moves the cursor to home or the first unprotected position. **Delimiters**--Sends a line delimiter after each line and a termination character after the transmission. Each protected field is bracketed by start and end protected field delimiters.[1]

[1]When protect mode is on, a field of graphics characters is bracketed by ESC $ and ESC %, and the terminal sends ESC G Ps for visual attributes.

LOADING AND SENDING MESSAGES

This section covers the message line, function keys, FUNCT key, terminal ID, and answerback message.

Displaying the Message Line

Display the message line	**ESC g**
Return to the status line	**ESC h**

These commands let you display the message line on the bottom (25th) line and then return to the status line.

Loading the Message Line

Load text into the message line	**ESC f <text>** **CTRL M**

You can enter 79 display characters and commands in the message line. Like the other display lines, the message line contains 80 character positions. The first character is always the current visual attribute (default is reverse video). You can change this visual attribute, but you cannot write over it with a display character.

The cursor does not enter the line during data entry; however, you can start writing at any column within the message. The command CTRL I Pc, where Pc is a column position value from Appendix E, causes data entry to start at position Pc.

Until you enter text in the message line, it is blank (except for the visual attribute in the first character position).

The following example shows how to enter text into the message line. If you are entering these commands from the keyboard, press LOC ESC (SHIFT-ESC).

1. Display the message line (if you want to see the message as you enter it) with

   ESC g

2. To start loading the message, enter

   ESC f

3. Change the visual attribute in the first character position if desired. The default attribute is reverse video.

4. Enter up to 79 characters of text. If you displayed the message line before entering text, you can see the message as you enter it.

5. You can also include visual attributes any place in the message with the command ESC G Ps. Remember to count these commands as part of the text characters.

6. Enter

   CTRL M

   to end the message.

The Default Function Key Codes

The function keys send the escape sequences listed in Table 5-14.

Default Function Key Codes
Table 5-14

Key	Unshifted Code	Shifted Code
F1	SOH @ CR	SOH ‘ CR
F2	SOH A CR	SOH a CR
F3	SOH B CR	SOH b CR
F4	SOH C CR	SOH c CR
F5	SOH D CR	SOH d CR
F6	SOH E CR	SOH e CR
F7	SOH F CR	SOH f CR
F8	SOH G CR	SOH g CR
F9	SOH H CR	SOH h CR
F10	SOH I CR	SOH i CR
F11	SOH J CR	SOH j CR
F12	SOH K CR	SOH k CR
F13	SOH L CR	SOH l CR
F14	SOH M CR	SOH m CR
F15	SOH N CR	SOH n CR
F16	SOH O CR	SOH o CR

NOTE: Function key codes are transmitted sequentially (as fast as the current baud rate permits). If a function key is pressed while the terminal is sending other data, the terminal sends the function key code after it sends the data. If your computer cannot accept codes at that speed, you can modify your software program, increase the transmit delay rate in set up, lower the baud rate, or change the handshaking protocol between the terminal and computer.

Reprogramming Function Keys

Reprogram a function key **ESC | p1 p2 <message> CTRL Y**

Key	p1	key	p1
F1	1	F9	9
F2	2	F10	:
F3	3	F11	;
F4	4	F12	<
F5	5	F13	=
F6	6	F14	>
F7	7	F15	?
F8	8	F16	@

p2 Message Destination

1 Send message to computer
2 Send message to terminal
3 Send message to both computer and terminal

You can reprogram only the 16 unshifted function keys. Their new contents are saved in nonvolatile memory, unless you selected SAVE OFF in the Miscellaneous set up menu.

Each function key message can contain up to seven bytes, including any combination of display and control characters. If you want to enter CTRL P or CTRL Y as part of the message, preface either character with CTRL P. Otherwise, the terminal interprets CTRL P and CTRL Y as commands.

Think about where you want the message to go before you enter p2. If you send it only to the terminal (p2 = 2), the computer cannot act on it. And if you send it only to the computer (p2 = 1), the message may not appear on the screen. (Unless the computer echoes it back to the terminal.)

For example, let's program key F1 to tell the terminal to move the cursor to the end of the screen and print the contents of the screen on a printer connected to the terminal. We'll send these messages to the terminal as escape sequences.

1. Send (or press LOC ESC)

   ESC |

   to start the programming sequence.

   NOTE: Press LOC ESC if you are entering the command from the keyboard.

2. Send (or press)

   1

   to specify the F1 key

3. Send (or press)

   2

   to send the message to the terminal.

   Now everything you enter after this and before CTRL Y (Steps 4 and 5) is part of the message that goes to the terminal when you press F1.

4. Send (or press)

   ESC = 7 o

   to address the cursor to the end of the screen. This defines the amount printed with the page print command in the next step. 7 and o are values from Appendix E that indicate the row (line) and column position.

5. Send (or press)

   ESC P

   to include the command to print an unprotected, formatted page in the function key message.

6. Send (or press)

CTRL Y

to end the message being loaded into the F1 key.

To calculate the bytes in this example, let's look at the entire command. The message portion appears in **bold** type.

ESC | 1 2 **ESC = 7 o ESC P** CTRL Y

Now let's tally the bytes. Remember, you only count the bytes in the message.

Entry	Bytes	Entry	Bytes
ESC	1	ESC	1
=	1	P	1
7	1		
o	1		

The message contains 6 bytes.

Now whenever the F1 key is pressed, the terminal moves the cursor to the end of the screen and prints the contents of the screen.

NOTE: An adhesive-backed bezel label comes with the terminal, taped to the bottom of the keyboard. If you permanently reprogram the function keys, you can write the new codes on the label and stick the label on the keyboard bezel directly above the function keys.

The FUNCT Key

The FUNCT key transmits the ASCII code of the next alphanumeric key pressed, bracketed by the SOH (start of header) and carriage return (CR) ASCII control characters.

Using the FUNCT key is similar to using the SHIFT key. For example, if your word processing program requires the sequence SOH C CR, you would hold down the FUNCT key while you press C.

The FUNCT key only works with alphanumeric (character) keys; don't press an editing key with the FUNCT key.

Because the terminal only transmits the codes to the computer (it does not echo them to the screen), the communication mode in effect is irrelevant.

NOTE: You may need to program your computer's input/output string routine to catch the entire string and then process it. (If you are using an interrupt-driven computer, you need not worry about data being lost.)

Sending the Terminal Identification

Send terminal identification **ESC M**

When the terminal receives this command, it returns the identification message **905 R.0 CTRL M** to the computer.

R = Firmware revision level
0 = Firmware revision sublevel

Sending the Answerback Message

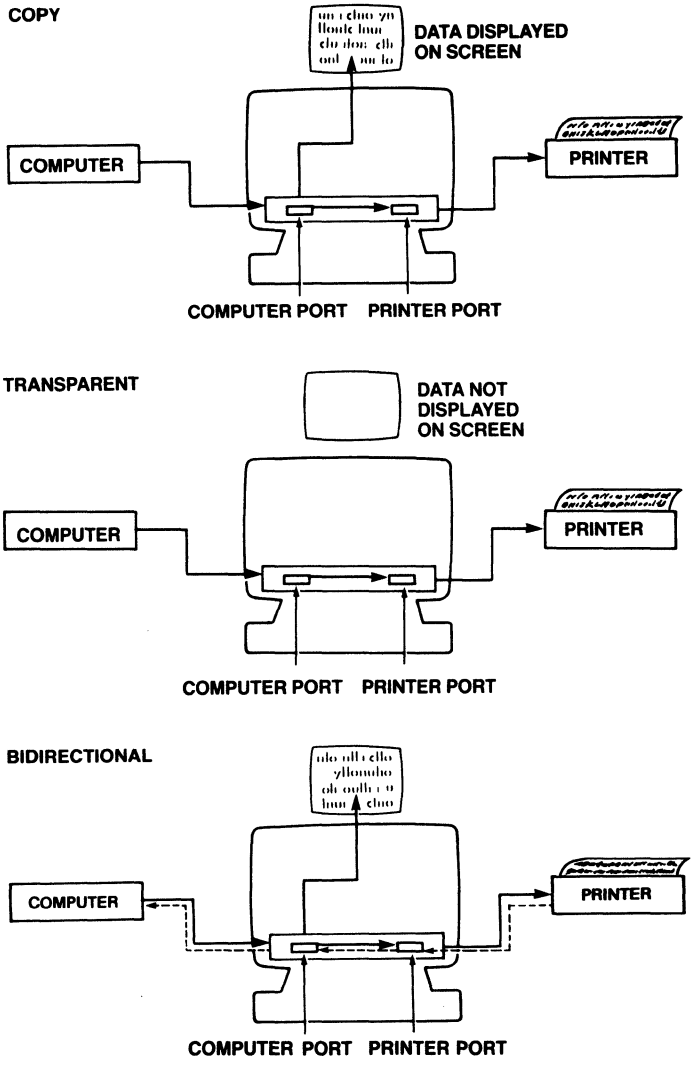
Send the answerback message **CTRL E**

The terminal sends the answerback message to the host when it receives this command. The default answerback message is blank; you can program a message of up to eight bytes in the second Miscellaneous set up line.

PRINTING

If you connect a printer to the terminal, you can print data from the computer or the screen. Terminal print modes determine how data is transmitted through the terminal.

Figure 5-9 shows the flow of data in print modes.



Print Modes
Figure 5-9

Print Modes and Protocols

The 905 has three print modes:

* Copy
* Transparent
* Bidirectional

All three modes are *buffered.* Buffered printing permits main and printer port baud rates to differ.

The terminal responds to a *page print* command during any print mode (page print is an action command, not a mode.) The page print can be *formatted* or *unformatted.*

The 905 recognizes *X-On/X-Off* and *DTR* handshaking signals from a printer (or other device, such a modem) connected to its printer port, except under certain conditions during bidirectional print mode.

The following paragraphs describe print modes and page print commands, and give the handshaking sequence for each case.

Copy print Data from host/keyboard is transmitted both to screen and printer. Handshaking operates as follows:

1. When printer buffer fills, printer sends X-Off or lowers DTR line voltage.

2. Terminal stops sending data to printer.

3. Printer port buffer fills; then main port buffer fills.

4. Terminal sends main port handshaking signal to the host (X-Off or DTR low) to stop sending data.

5. When main port buffer empties (into the printer port buffer), the terminal sends main port handshaking signal to the host to resume sending data.

Transparent print Data from host/keyboard is transmitted to printer only; screen display freezes. Handshaking operates as follows:

1. When printer buffer fills, printer sends X-Off or lowers DTR line voltage.

2. Terminal stops sending data to printer.

3. Printer port buffer fills, then terminal sends X-Off to computer.

4. If host ignores X-Off, main port buffer fills.

5. Terminal sends main port handshaking signal to the host (X-Off or DTR low) to stop sending data.

6. When main port buffer empties (into the printer port buffer), the terminal sends main port handshaking signal to the host to resume sending data.

7. If the printer port buffer also empties, the terminal sends X-On to host.

Bidirectional print Data from host/keyboard transmits to both screen and printer; data from printer goes to host only. Three handshaking sequences are possible, depending on main and printer port protocols:

A. Both ports: X-On/X-Off

1. When printer buffer fills, printer sends X-Off.

2. Terminal stops sending data to printer. (Responds to X-Off as command, rather than passing it to host as data.)

3. When main and printer port buffers fill, terminal sends X-Off to host.

B. Printer: X-On/X-Off; main: DTR or none

1. When printer buffer fills, printer sends X-Off.

2. Terminal passes X-Off to host as data and continues sending data to the printer.

3. If host does not respond to X-Off, buffers may overflow and *printer may lose data.*

C. Printer: DTR; main: any

1. When printer buffer fills, printer lowers DTR line voltage.

2. Terminal stops sending data to printer.

3. When main and printer port buffers fill, terminal signals host to stop sending data.

Page print Data from screen (home through cursor position) is transmitted to printer. Space characters are transmitted for graphics characters.

Formatted unprotected	Adds CR, LF, and null characters after each line. Sends space characters for protected characters.
Unformatted all	Sends all characters; does not add delimiters.
Protocols	Screen updating halts during transmission. Terminal responds to X-On/X-Off or DTR signals from printer during page print. Terminal sends ACK (hex 06) after transmission to host to signal end of page print.

Print Commands

Buffered copy print mode on	**ESC @**
Buffered copy print mode off	**ESC A**
Buffered transparent print mode on	**ESC ‘**
Buffered transparent print mode off	**ESC a**
Buffered bidirectional print mode on	**CTRL R**
Buffered bidirectional print mode off	**CTRL T**
Print unprotected formatted page	**ESC P**
	key PRINT
Print all unformatted page	**ESC L**
	key SHIFT-PRINT

All print modes are mutually exclusive: you can only enable one at a time. You can print a page any time.

Page Print Terminator

	DEFAULT = ACK
Define the page print terminator	**ESC p Ps**

Ps = Any ASCII character

This command reprograms the ASCII character the terminal sends to the computer after each page print to signal the end of the transmission. The terminal saves the reprogrammed value in nonvolatile memory.

APPENDICES

APPENDIX A SPECIFICATIONS

Part number	131525-00
Case	Touch tilt (-5 to +15 degrees); swivel (270 degrees); front-mounted power switch, brightness adjustment, and keyboard connector
Screen	14 inches measured diagonally; P31 green nonglare phosphor; screen saver; selectable on/off and background color
Display format	24 80-column lines; 25th message line; 5 set up lines; self test screen
Character formation	7 x 9 dot matrix; 9 x 13 character cell
Character sets	US ASCII standard (96 upper- and lowercase display with descenders, 32 control); 16 special graphics
Visual attributes	Embedded blink, blank, underline, reverse field-based; full/half intensity character-based
Cursor attributes	Block (blinking or steady), underline (blinking or steady), none
Cursor control	Home, up, down, right, left; carriage return, line feed, reverse line feed, new line; typewriter and field tabs (forward and backward); address, read
Editing	Character/line insert/delete; line/page/field erase; field/page clear; protect mode
Code compatibility	TeleVideo 910 and 925, Hazeltine 1410 and 1500, Lear Siegler ADM-3A/5, ADDS Viewpoint A2 and Regent 25, Qume QVT-101
Reprogramming	16 nonvolatile function keys, message line; send and print delimiters

Communication Modes	Conversational (full or half duplex), block; monitor; local or duplex edit
Print capabilities	Formatted/unformatted page print; buffered copy, transparent, and bidirectional print modes
Communication interfaces	RS-232C 256-character buffered transmit/receive computer port; RS-232C 256-character buffered printer port; selectable character transmit delay rate
Communication protocols	X-On/X-Off or Data Terminal Ready at either RS-232C port
Word structure	7 or 8 data bits; 1 or 2 stop bits; 10- or 11-bit word
Parity	Odd, even, mark, space, or none
Baud rates	15 main and printer port (50 to 19,200 Kb)
Keyboard	Detached, slim-line, typewriter-style with sculptured keycaps; sealed key switches; N-key rollover with ghost key lockout; accounting-style numeric keypad with TAB and ENTER keys; on/off repeat and keyclick; 32 nonprogrammable and 16 nonvolatile reprogrammable function keys
Power requirements	115/230 volt ac, 50/60 Hz

Dimensions

	Height (in.)	Height (cm)	Width (in.)	Width (cm)	Depth (in.)	Depth (cm)
Cabinet	15.0	38.1	12.8	32.5	12.8	32.5
Keyboard	1.8	4.6	17.8	45.2	7.3	18.4
Footprint	12.5 x 11.5					

Weight

Net	26 pounds 13 ounces
Shipping	33 pounds 12 ounces

Environmental requirements

Ventilation	4 inches minimum on all sides
Temperature	Operating: 32 degrees F (0 degrees C) to 113 degrees F (45 degrees C) Storage: -40 degrees F (-40 degrees C) to 149 degrees F (65 degrees C)
Relative humidity	Operating: 10%-85% noncondensing. Nonoperating: 10%-85% noncondensing.
Maximum power	25 watts

Option board

Available power (beyond normal load)	5V	200 mA
	+12V	0 amp
	-12V	100 mA

Options	20 mA current loop interface; seven foreign character generator EPROMs with matching keycaps (U.K., German, French, Spanish, Italian, Finnish, Norwegian)

APPENDIX B STATEMENT OF LIMITED WARRANTY

TeleVideo Systems, Inc. ("TeleVideo") warrants to its distributors, systems houses, end users, and OEMs ("Buyer"), that products manufactured by TeleVideo are free from defects in materials and workmanship. TeleVideo's obligations under this warranty are limited to repairing or replacing, at TeleVideo's option, the part or parts of the products which prove defective in material or workmanship within 15 months after shipment by TeleVideo. Buyer must pass along to its initial customer or user ("Customer") a minimum of 12 months' coverage within this 15-month warranty period, provided that Buyer gives TeleVideo prompt notice of any defect and satisfactory proof thereof.

Products may be returned by Buyer only after a Return Material Authorization number ("RMA") has been obtained from TeleVideo by telephone or in writing. Buyer will prepay all freight charges to return any products to the repair facility designated by TeleVideo and include the RMA number on the shipping container. TeleVideo will, at its option, either repair the defective products or parts or deliver replacements for defective products or parts on an exchange basis to Buyer, freight prepaid to the Buyer. Products returned to TeleVideo under this warranty will become the property of TeleVideo. With respect to any product or part thereof not manufactured by TeleVideo, only the warranty, if any, given by the manufacturer thereof, applies.

EXCLUSIONS

This limited warranty does not cover losses or damage which occurs in shipment to or from Buyer, or are due to, (1) improper installation or maintenance, misuse, neglect, or any cause other than ordinary commercial or industrial application, or (2) adjustment, repair, or modifications by other than TeleVideo-authorized personnel, or (3) improper environment, excessive or inadequate heating or air conditioning and electrical power failures, surges, or other irregularities, or (4) any statements made about TeleVideo's products by salesmen, dealers, distributors or agents, unless confirmed in writing by a TeleVideo officer.

If the firmware or hardware is altered or modified by the Buyer, this firmware and hardware is not covered within this limited warranty and the Buyer bears sole responsibility and liability for that firmware and hardware.

THE FOREGOING TELEVIDEO LIMITED WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, WHETHER ORAL, WRITTEN, EXPRESSED, IMPLIED, OR STATUTORY. IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE DO NOT APPLY. TELEVIDEO'S WARRANTY OBLIGATIONS AND DISTRIBUTOR'S REMEDIES HEREUNDER ARE SOLELY AND EXCLUSIVELY AS STATED HEREIN.

TELEVIDEO'S LIABILITY, WHETHER BASED ON CONTRACT, TORT, WARRANTY, STRICT LIABILITY, OR ANY OTHER THEORY, SHALL NOT EXCEED THE PRICE OF THE INDIVIDUAL UNIT WHOSE DEFECT OR DAMAGE IS THE BASIS OF THE CLAIM. IN NO EVENT SHALL TELEVIDEO BE LIABLE FOR ANY LOSS OF PROFITS, LOSS OF USE OF FACILITIES OR EQUIPMENT, OR OTHER INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES.

APPENDIX C ASCII TABLES

ASCII Code Chart
Table C-1

BITS 7 6 5	4	3	2	1	Row ↓ / Column →	0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
						0	1	2	3	4	5	6	7
	0	0	0	0	0	NUL 0 0 0	DLE 20 16 10	SP 40 32 20	0 60 48 30	@ 100 64 40	P 120 80 50	` 140 96 60	p 160 112 70
	0	0	0	1	1	SOH 1 1 1	DC1 (XON) 21 17 11	! 41 33 21	1 61 49 31	A 101 65 41	Q 121 81 51	a 141 97 61	q 161 113 71
	0	0	1	0	2	STX 2 2 2	DC2 22 18 12	" 42 34 22	2 62 50 32	B 102 66 42	R 122 82 52	b 142 98 62	r 162 114 72
	0	0	1	1	3	ETX 3 3 3	DC3 (XOFF) 23 19 13	# 43 35 23	3 63 51 33	C 103 67 43	S 123 83 53	c 143 99 63	s 163 115 73
	0	1	0	0	4	EOT 4 4 4	DC4 24 20 14	$ 44 36 24	4 64 52 34	D 104 68 44	T 124 84 54	d 144 100 64	t 164 116 74
	0	1	0	1	5	ENQ 5 5 5	NAK 25 21 15	% 45 37 25	5 65 53 35	E 105 69 45	U 125 85 55	e 145 101 65	u 165 117 75
	0	1	1	0	6	ACK 6 6 6	SYN↓ 26 22 16	& 46 38 26	6 66 54 36	F 106 70 46	V 126 86 56	f 146 102 66	v 166 118 76
	0	1	1	1	7	BEL 7 7 7	ETB 27 23 17	' 47 39 27	7 67 55 37	G 107 71 47	W 127 87 57	g 147 103 67	w 167 119 77
	1	0	0	0	8	BS← 10 8 8	CAN 30 24 18	(50 40 28	8 70 56 38	H 110 72 48	X 130 88 58	h 150 104 68	x 170 120 78
	1	0	0	1	9	HT 11 9 9	EM 31 25 19	) 51 41 29	9 71 57 39	I 111 73 49	Y 131 89 59	i 151 105 69	y 171 121 79
	1	0	1	0	A(10)	LF 12 10 A	SUB 32 26 1A	* 52 42 2A	: 72 58 3A	J 112 74 4A	Z 132 90 5A	j 152 106 6A	z 172 122 7A
	1	0	1	1	B(11)	VT↓ 13 11 B	ESC 33 27 1B	+ 53 43 2B	; 73 59 3B	K 113 75 4B	[133 91 5B	k 153 107 6B	{ 173 123 7B
	1	1	0	0	C(12)	FF→ 14 12 C	FS 34 28 1C	, 54 44 2C	< 74 60 3C	L 114 76 4C	\ 134 92 5C	l 154 106 6C	| 174 124 7C
	1	1	0	1	D(13)	CR 15 13 D	GS 35 29 1D	– 55 45 2D	= 75 81 3D	M 115 77 4D	] 135 93 5D	m 155 108 6D	} 175 125 7D
	1	1	1	0	E(14)	SO 16 14 E	RS 36 30 1E	. 56 46 2E	> 76 62 3E	N 116 78 4E	^ 136 94 5E	n 156 110 6E	~ 176 126 7E
	1	1	1	1	F(15)	SI 17 15 F	US 37 31 1F	/ 57 47 2F	? 77 63 3F	O 117 79 4F	— 137 95 5F	o 157 111 6F	DEL 177 127 7F

KEY

ESC	33	OCTAL
	27	DECIMAL
	1B	HEX

Monitor Mode Control Characters
Table C-2

Control Code	ASCII Character	Hex Value	Character Displayed
CTRL @	NUL	00	N_L
CTRL A	SOH	01	S_H
CTRL B	STX	02	S_X
CTRL C	ETX	03	E_X
CTRL D	EOT	04	E_T
CTRL E	ENQ	05	E_Q
CTRL F	ACK	06	A_K
CTRL G	BEL	07	B_L
CTRL H	BS	08	B_S
CTRL I	HT	09	H_T
CTRL J	LF	0A	L_F
CTRL K	VT	0B	V_T
CTRL L	FF	0C	F_F
CTRL M	CR	0D	C_R
CTRL N	SO	0E	S_O
CTRL O	SI	0F	S_I
CTRL P	DLE	10	D_L
CTRL Q	DC1	11	D_1
CTRL R	DC 2	12	D_2
CTRL S	DC 3	13	D_3
CTRL T	DC 4	14	D_4
CTRL U	NAK	15	N_K
CTRL V	SYN	16	S_Y
CTRL W	ETB	17	E_B
CTRL X	CAN	18	C_N
CTRL Y	EM	19	E_M
CTRL Z	SUB	1A	S_B
CTRL [	ESC	1B	E_C
CTRL \	FS	1C	F_S
CTRL]	GS	1D	G_S
CTRL ^	RS	1E	R_S
CTRL _	US	1F	U_S
DEL	DEL	7F	▒

ASCII Control Character Abbreviations
Table C-3

NUL	null	FF	form feed	CAN	cancel
SOH	start of heading	CR	carriage return	EM	end of medium
STX	start of text	SO	shift out	SUB	substitute
ETX	end of text	SI	shift in	ESC	escape
EOT	end of transmission	DLE	data link escape	FS	file separator
ENQ	enquiry	DC1	device control 1	GS	group separator
ACK	acknowledge	DC2	device control 2	RS	record separator
BEL	bell	DC3	device control 3	US	unit separator
BS	backspace	DC4	device control 4	SP	space
HT	horizontal tabulation	NAK	negative acknowledge	DEL	delete
LF	linefeed	SYN	synchronous idle		
VT	vertical tabulation	ETB	end of transmission block		

APPENDIX D RS-232C SIGNAL ASSIGNMENTS

When connecting the terminal to a computer (or modem) and printer, start by answering two questions:

* Which signals does each unit require for proper communication?

* Is the serial port for each interface DCE or DTE type?

Typically, the terminal requires only Transmit Data, Receive Data, and Signal Ground (pins 2, 3, and 7) to communicate with a computer and printer. Note in Tables D-1 and D-2 that the main port is a DTE port and the printer port is a DCE port.

Main Port (DTE) Signal Assignments
Table D-1

Pin No.	Signal Name	Direction
1	Frame Ground	n/a
2	Transmit Data	Output
3	Receive Data	Input
4	Request to Send	Output
5	Clear to Send	Input
6	Data Set Ready	Input
7	Signal Ground	n/a
8	Data Carrier Detect	Input
20[1]	Data Terminal Ready	Output

[1]Modems often require pin 20.

Printer Port (DCE) Signal Assignments
Table D-2

Pin No.	Signal Name	Direction
1	Frame Ground	n/a
2	Transmit Data	Input
3	Receive Data	Output
5	Clear to Send	Output
6	Data Set Ready	Output
7	Signal Ground	n/a
8	Data Carrier Detect	Output
20	Data Terminal Ready	Input

Check your computer and printer manuals for information about their port type, required signals, and signal direction. See the remarks following Table D-3 if you are connecting the terminal to a modem.

If your computer has a 25-pin DCE port and your printer has a 25-pin DTE port, you should be able to connect the terminal to each with a standard interface cable, without any modifications.

However, your computer or printer may not have a 25-pin connector (some units have a 9-pin connector, for example). Or the DCE/DTE interfaces may not match up. In such cases, consult a technician or your dealer for assistance. This manual cannot specify pin connections for the multitude of nonstandard configurations available.

After you determine signal connections, you may find the cable connector needs rewiring. You (or a technician) can remove the connector from the cable and shift cable wires from one pin to another. Or your computer dealer may carry a ready-made adapter.

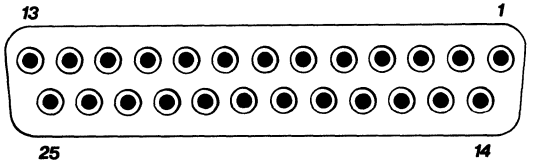
If your computer or printer fail to communicate properly after you connect them to the terminal, ask a service technician or your dealer for assistance.

A Few Words About RS-232C

RS-232C is an interface standard from the Electronic Industries Association. Its complete title is "Interface Between Data Terminal Equipment and Data Communication Equipment Employing Serial Binary Data Interchange." You can see why it's commonly just called RS-232C.

The RS-232C standard names and defines 20 communication signals, assigned to separate pins in a 25-pin connector. The five unassigned pins may carry nonstandard signals required by any individual system.

Each signal is transmitted as a positive or negative electric current between 3 and 15 volts. (Five and 12 volts are two commonly used voltages.) The signal assigned to each pin flows in one direction only. Signals *output* from a terminal must be *input* to a computer or printer, and vice versa.



25-Pin RS-232C Connector
Figure D-1

RS-232C signals travel over a serial interface cable that may have up to 25 wires, each of which can be attached to a pin in the connector at either end of the cable. Since most signals are not required for simple communication by a terminal, cables usually have less than 25 wires, with only the necessary wires attached to the connectors.

The signals flow between two types of interface port: data communication equipment (DCE) and data terminal equipment (DTE). Table D-3 shows names, pin assignments, and directions of commonly required RS-232C signals.

Commonly Required RS-232C Signals
Table D-3

Pin	Abbrev.	Name	Direction DCE	Direction DTE
1	FG	Frame Ground	n/a	n/a
2	TxD	Transmit Data	Input	Output
3	RxD	Receive Data	Output	Input
4	RTS	Request to Send	Input	Output
5	CTS	Clear to Send	Output	Input
6	DSR	Data Set Ready	Output	Input
7	SG	Signal Ground	n/a	n/a
8	DCD	Data Carrier Detect	Output	Input
15	RC	Receive Clock	Output	Input
17	TC	Transmit Clock	Output	Input
20	DTR	Data Terminal Ready	Input	Output
22	RI	Ring Indicator	Output	Input

Pin signals 2 and 3 are the actual transmitted data. The others are control signals, ensuring that communication flows in an orderly fashion.

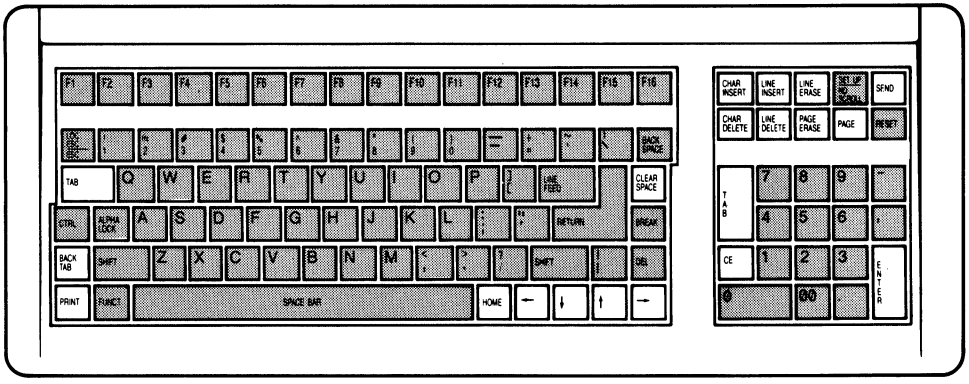
Modems may output signals on pins 15, 17, and 22 (also others, such as pin 12). However, the terminal does not need these signals to communicate with a modem. Consult your modem manual for the communication signals it requires from the terminal. In most cases, you can connect the modem without reconfiguring the cable. You will need to consult a technician, however, if the modem requires an *input* signal that the terminal does not *output*.

APPENDIX E CURSOR COORDINATES

Row/ Column	ASCII Code Transmitted	Row/ Column	ASCII Code Transmitted	Row/ Column	ASCII Code Transmitted	Row/ Column	ASCII Code Transmitted
1	Space	28	;	55	V	82	q
2	!	29	<	56	W	83	r
3	"	30	=	57	X	84	s
4	#	31	>	58	Y	85	t
5	$	32	?	59	Z	86	u
6	%	33	@	60	[	87	v
7	&	34	A	61	\	88	w
8	'	35	B	62	]	89	x
9	(	36	C	63	^	90	y
10	)	37	D	64	_	91	z
11	*	38	E	65	`	92	{
12	+	39	F	66	a	93	¦
13	,	40	G	67	b	94	}
14	-	41	H	68	c	95	~
15	.	42	I	69	d	96	DEL
16	/	43	J	70	e		
17	0	44	K	71	f		
18	1	45	L	72	g		
19	2	46	M	73	h		
20	3	47	N	74	i		
21	4	48	O	75	j		
22	5	49	P	76	k		
23	6	50	Q	77	l		
24	7	51	R	78	m		
25	8	52	S	79	n		
26	9	53	T	80	o		
27	:	54	U	81	p		

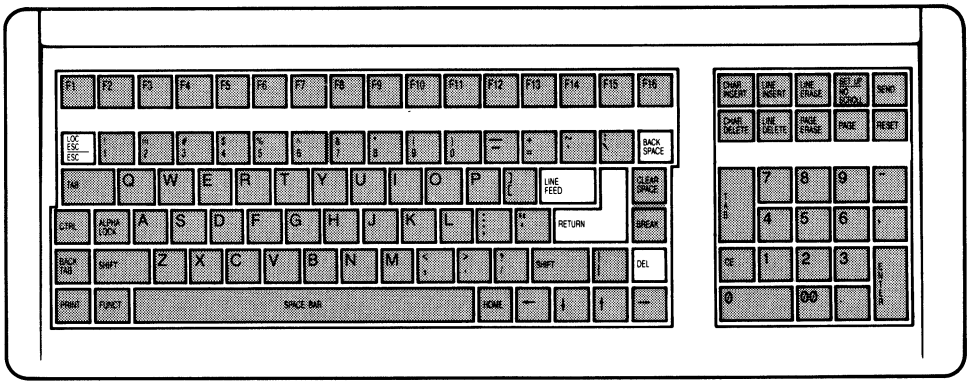
APPENDIX F KEY DESCRIPTIONS

Editing keys send ASCII codes that control editing operations and cursor movement.



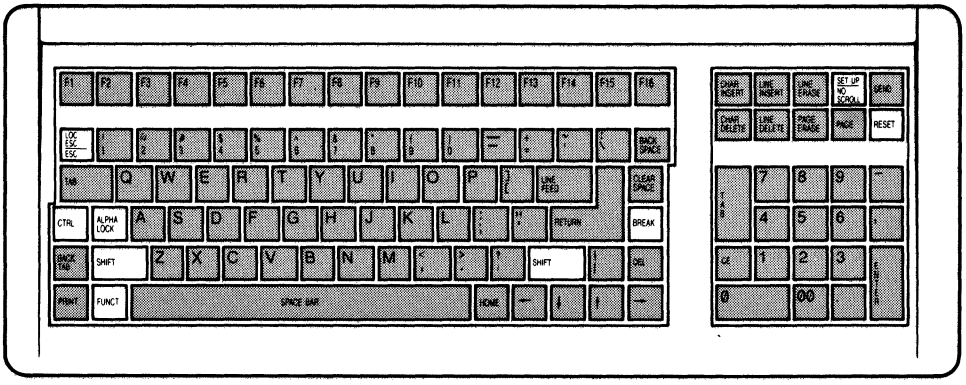
Keys Affected by Editing Key Mode
Figure F-1

The 20 keys shown above are affected by editing key mode.



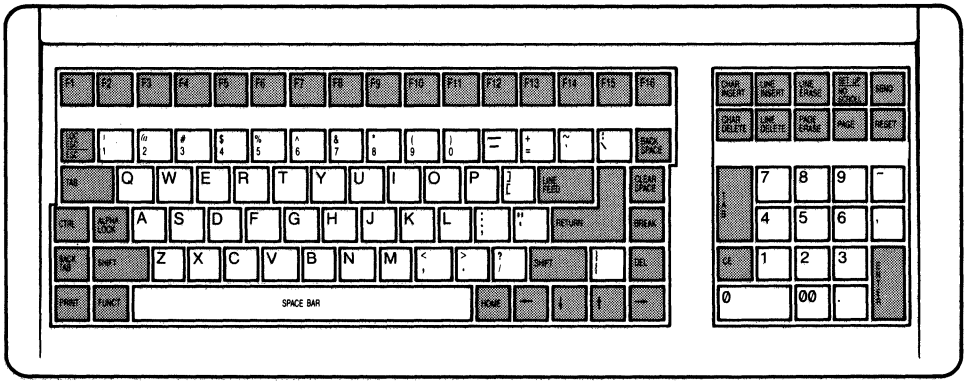
Other Editing Keys
Figure F-2

The ESC, RETURN, LINE FEED, BACK SPACE, and DEL keys send ASCII codes but are not affected by editing key mode.



Special and Local Keys
Figure F-3

The special and local keys control terminal operations but do not send ASCII codes.



Alphanumeric Keys
Figure F-4

Key Functions
Table F-1

Key	Function
DOWN	Moves the cursor down one line in the same column. At the bottom line, data may scroll up, depending on the setting of autoscroll and down key modes.
DOWN + SHIFT	Same effect as LINE FEED key.
LEFT	Moves cursor left one character. Can wrap the cursor around to the previous line. Terminal operating modes may affect its operation differently than they affect the BACK SPACE key.
RIGHT	Moves the cursor right one position. Can wrap the cursor to the next line.
UP	Moves the cursor up one line within the same column until it reaches the top line.
UP + SHIFT	Reverse line feed. Moves the cursor up to the previous line in the same column. At the screen's top line, data scrolls down one line if autoscroll is enabled.
ALPHA LOCK	Capitalizes all alphabetic keys, but does not select the upper characters or functions of other keys.
BACK SPACE	Moves the cursor left one character. Operating modes may affect its operation differently than they affect the LEFT key.
BACK TAB	Returns the cursor to the previous typewriter tab stop or to the first column if no tab stop is set (if protect mode is off) or to the start of the current or previous unprotected field (if protect mode is on).
BACK TAB + SHIFT	Clears the typewriter tab stop at the cursor location.

Key Functions
Table F-1 (continued)

Key	Function
BREAK	No function when pressed alone.
BREAK + CTRL	Sends a **break signal**, used in programs, which may disconnect a modem.
CTRL + SHIFT + BREAK	Partially resets the terminal. See the section in Chapter 3 on resetting the terminal.
CE	Replaces all data in the current tab field with space characters. With protect mode off, clears data between typewriter tab stops and moves the cursor back to the beginning of the current tab field. Clears the entire line if it has no tab stops. With protect mode on, clears all data in the cursor's unprotected field. Does not repeat.
CE + SHIFT	Clears all typewriter tab stops. Does not repeat.
CHAR DELETE	Deletes an unprotected cursor character and shifts all succeeding characters in the current line or field one position to the left from the end of the line or beginning of the next protected field. Adds space character(s) at the end of the shifted text.
CHAR INSERT	Adds a space character at the cursor position, shifting all succeeding unprotected characters right one position. Shifted characters are lost at the end of the line or beginning of a protected field.
CLEAR SPACE	Replaces all unprotected characters on the screen with space characters.
CLEAR SPACE + SHIFT	Turns off half-intensity (write protect) and protect modes. Replaces all data with null characters.

Key Functions
Table F-1 (continued)

Key	Function
CTRL	Pressed **with** some character keys to send operating commands (control characters). Pressed with other special keys to reset the terminal or send a break signal.
DEL	Has no default function and displays no character. Operation determined solely by application program. Does not repeat.
ENTER	Sends a carriage return code. Not affected by new line mode. Does not repeat.
ESC	When pressed **immediately before** pressing a character key, causes the character key to send an operating command (escape sequence). Does not repeat.
FUNCT	Brackets the ASCII code of a simultaneously pressed display character key with SOH (hex 01) and CR (hex 0D). Example: pressing FUNCT-B sends SOH B CR.
HOME	Moves the cursor to the screen's first unprotected position (**home** position). Does not repeat.
LINE DELETE	Removes the current line and shifts lines below it up one line. Fills the last line of the screen with a line of space characters. Ignored while protect mode is on.
LINE ERASE	Replaces data from the cursor to the end of the line or the beginning of the next protected field (whichever comes first) with space characters. With protect mode on, the effect is limited to the current field.
LINE ERASE + SHIFT	Replaces data from the cursor to the end of the line with null characters. With protect mode on, the effect is limited to the current field.

Key Functions
Table F-1 (continued)

Key	Function
LINE FEED	Moves the cursor down one line in the same column. At the bottom line, data scrolls up if autoscroll mode is enabled. Terminal operating modes may affect whether its operation is a line feed or line feed and carriage return.
LINE INSERT	Adds a line of space characters on the cursor line. All lines below shift down one line; the bottom line scrolls off the screen. Has no effect when protect mode is on.
LOC ESC	When pressed instead of ESC, sends escape sequences from the keyboard to the terminal only.
NO SCROLL	Freezes the screen. Any incoming data from the computer accumulates in the main port receive buffer until the buffer reaches its fill limit. The terminal then sends X-Off to the computer. Pressing the NO SCROLL key again permits data to resume scrolling onto the screen. When the main port buffer empties to 16 characters, the terminal sends X-On to the computer.
PAGE	No effect.
PAGE ERASE	Replaces unprotected data between the cursor and the end of the screen with space characters.
PAGE ERASE + SHIFT	Replaces unprotected data between the cursor and the end of the screen with null characters.
PRINT	Formatted page print. Sends carriage return, line feed, and null characters to the printer after each line. Replaces special graphics and write-protected characters with space characters. Does not repeat.
PRINT + SHIFT	Unformatted page print. Carriage return, line feed, and null characters are not sent to the printer after each line. Does not repeat.

Key Functions
Table F-1 (continued)

Key	Function
RESET	Resets the terminal when pressed with CTRL. See the section in Chapter 3 on resetting the terminal.
RETURN	Returns the cursor to the first position on the line. Terminal operating modes may affect whether its operation is a carriage return or line feed and carriage return. Does not repeat.
SEND	Sends screen contents up to and including the cursor to the computer. Does not repeat.
SEND + SHIFT	Sends current line up to and including the cursor to the computer. Does not repeat.
SET UP	Displays the first set up line. Press again to leave set up.
SHIFT	Capitalizes letters and selects the upper characters or functions of other keys.
TAB	If protect mode is off, moves the cursor forward to the next typewriter tab stop. If protect mode is on, moves it to the next field tab stop (start of the next unprotected field).
TAB + SHIFT[1]	Sets tab stop at cursor position (main keypad only).

[1]The unshifted TAB keys on the main keypad and numeric keypad have the same default code and function. However, shifted TAB on the main keypad transmits ESC 1 (set tab), while the shifted numeric keypad TAB key sends CTRL I.

Editing Key Codes
Table F-2

Keys	905	910	VP A2	ADDS 25
HOME	CTRL ^	CTRL ^	CTRL A	CTRL A
DOWN	CTRL V	CTRL J	CTRL J	CTRL J
Shifted	CTRL J			
UP	CTRL K	CTRL K	CTRL Z	CTRL Z
Shifted	ESC j			
RIGHT	CTRL L	CTRL L	CTRL F	CTRL F
LEFT	CTRL H	CTRL H	CTRL U	CTRL U
BACK SPACE	CTRL H	CTRL H	CTRL H	CTRL H
TAB (main)	CTRL I	CTRL I	CTRL I	CTRL I
Shifted	ESC 1			
BACK TAB	ESC I	ESC I	ESC O	ESC O
Shifted	ESC 2	ESC 2		
LINE FEED	CTRL J	CTRL J	CTRL J	CTRL J
ENTER	CTRL M	CTRL M	CTRL M	CTRL M
RETURN	CTRL M	CTRL M	CTRL M	CTRL M
CLEAR SPACE	CTRL Z	CTRL Z	CTRL L	CTRL L
Shifted	ESC *	ESC *		
CE	CTRL X	CTRL X		
Shifted	ESC 3	ESC 3		
CHAR INSERT	ESC Q	ESC Q	ESC F	ESC F
CHAR DELETE	ESC W	ESC W	ESC E	ESC E
LINE INSERT	ESC E	ESC E	ESC M	ESC M
LINE DELETE	ESC R	ESC R	ESC *l*	ESC *l*
LINE ERASE	ESC T	ESC T	ESC K	ESC K
Shifted	ESC t	ESC t		
PAGE ERASE	ESC Y	ESC Y	ESC k	ESC k
Shifted	ESC y	ESC y		
TAB (kypad)	CTRL I	CTRL I	CTRL I	CTRL I
Shifted		ESC 1		
SEND	ESC 7	ESC 7		
Shifted	ESC 6	ESC 6		
PRINT	ESC P	ESC @	CTRL R	CTRL R
Shifted	ESC L	ESC A	CTRL T	CTRL T
PAGE	ESC K	ESC K		
Shifted	ESC J	ESC J		

Editing Key Codes
Table F-2 (continued)

Keys	ADM3A/5	1410/1500	QVT-101
HOME	CTRL ^	~ CTRL R	CTRL ^
DOWN	CTRL J	~ CTRL K	CTRL J
UP	CTRL K	~ CTRL L	CTRL K
RIGHT	CTRL L	CTRL P	CTRL L
LEFT	CTRL H	CTRL H	CTRL H
BACK SPACE	CTRL H	CTRL H	CTRL H
TAB (main)	CTRL I	CTRL I	CTRL I
BACK TAB	ESC I	~CTRL I	ESC I
Shifted	ESC 2		
LINE FEED	CTRL J	CTRL J	CTRL J
ENTER	CTRL M	CTRL M	CTRL M
RETURN	CTRL M	CTRL M	CTRL M
CLEAR SPACE	CTRL Z	~ CTRL \	CTRL Z
Shifted	ESC *		ESC *
CE			
Shifted	ESC 3		
CHAR INSERT	ESC Q		ESC Q
CHAR DELETE	ESC W		ESC W
LINE INSERT	ESC E	~ CTRL Z	ESC E
LINE DELETE	ESC R	~ CTRL S	ESC R
LINE ERASE	ESC T	~ CTRL O	ESC T
Shifted	ESC t		
PAGE ERASE	ESC Y	~ CTRL X	ESC Y
Shifted	ESC t		
TAB (kypad)	CTRL I	CTRL I	CTRL I
Shifted	ESC 1		
SEND	ESC 7		
Shifted	ESC 6		
PRINT	CTRL R		ESC @
Shifted	CTRL T		ESC A
PAGE	ESC K		

APPENDIX G CONTROL CODES AND ESCAPE SEQUENCES

The following pages contain a summary of codes for all the 905 code compatibility modes: TeleVideo 905 and 910, ADDS Viewpoint A2 and Regent 25, ADM 3A/5, Hazeltine 1410/1500, and Qume QVT-101.

Command Set Summary[1]
Table G-1

Command	905	910	VP A2	ADDS 25
Cursor home	CTRL ^	CTRL ^	CTRL A	CTRL A
New line	CTRL _	CTRL _		**CTRL _**
Carriage return	CTRL M	CTRL M	CTRL M	CTRL M
Line feed	CTRL J	CTRL J	CTRL J	CTRL J
Cursor down	CTRL V			
Cursor up	CTRL K	CTRL K	CTRL Z	CTRL Z
Cursor right	CTRL L	CTRL L	CTRL F	CTRL F
Cursor left	CTRL H	CTRL H	CTRL H	CTRL H
			CTRL U	CTRL U
Reverse line feed	ESC j			
Address the cursor				
To row, column	ESC rc	ESC rc	ESC Y rc	ESC Y rc
To row		ESC [r	CTRL K r	CTRL K r
To column		ESC] c	CTRL P c	CTRL P c
Read the cursor				
Row, column	ESC ?	ESC ?		**ESC ?**
Column,. row				
Tab	CTRL I	CTRL I	CTRL I	CTRL I
Set tab stop	ESC 1	ESC 1		**ESC 1**
Clear tab stop at cursor	ESC 2	ESC 2		**ESC 2**
Clear all tab stops	ESC 3	ESC 3		
Back tab	ESC I	ESC I	**ESC O**	**ESC O**
Field tab	ESC i	ESC i		
Clear				
Unprotected	CTRL Z	**CTRL Z**		
to spaces	ESC ;	**ESC ;**		
	ESC +	**ESC +**		
All to		CTRL Z	CTRL L	CTRL L
spaces		ESC ;		
		ESC +		
Unprotected	ESC :	**ESC :**		
to nulls				

[1]Terminal recognizes **boldface** commands only during enhanced mode.

Command Set Summary[1]
Table G-1 (continued)

Command	ADM3A/5	1410/1500[2]	QVT-101
Cursor home	CTRL ^	~ CTRL R	CTRL ^
New line	**CTRL _**		CTRL _
Carriage return	CTRL M	CTRL M	CTRL M
Line feed	CTRL J	CTRL J	CTRL J
Cursor down		~ CTRL K	
Cursor up	CTRL K	~ CTRL L	CTRL K
Cursor right	CTRL L	CTRL P	CTRL L
Cursor left	CTRL H	CTRL H	CTRL H
Address the cursor			
To row, column	ESC = rc		ESC = rc
To column, row		~ CTRL Q cr	
To row	**ESC [r**		ESC [r
To column	**ESC] c**		ESC] c
Read the cursor			
Row, column	**ESC ?**		ESC ?
Column, row		~ CTRL E	
Tab	CTRL I	CTRL I	CTRL I
Set tab stop	**ESC 1**		ESC 1
Clear tab stop at cursor	**ESC 2**		ESC 2
Clear all tab stops	**ESC 3**		ESC 3
Back tab	**ESC I**	**~ CTRL I**	ESC I
Field tab	**ESC i**	CTRL I	
Clear			
Unprotected to spaces	CTRL Z ESC ;	~ CTRL]	ESC ;
All to spaces	ESC +	~ CTRL \	ESC + CTRL Z
Unprotected to nulls			ESC :

[1]Terminal recognizes **boldface** commands only during enhanced mode.
[2]Start commands prefaced by tilde (~) with ~ or ESC as lead-in character.

Command Set Summary[1]
Table G-1 (continued)

Command	905	910	VP A2	ADDS 25
Clear				
All to nulls	ESC *	ESC *		ESC *
Unprotected to h.i. spaces	ESC ,	ESC ,		
Field	CTRL X	CTRL X		
Erase				
Line to spaces	ESC T	ESC T	ESC K	ESC K
Line to nulls	ESC t			
Page to spaces	ESC Y	ESC Y	ESC k ESC J	ESC k
Page to h.i. spaces				
Page to nulls	ESC y			
Insert character	ESC Q	ESC Q	ESC F	ESC F
Delete character	ESC W	ESC W	ESC E	ESC E
Insert line	ESC E	ESC E	ESC M	ESC M
Delete line	ESC R	ESC R	ESC l	ESC l
Enable keyboard	ESC "	ESC "	ESC 6 CTRL B	ESC 6
Disable keyboard	ESC #	ESC #	ESC 5 CTRL D	ESC 5
Keyclick on	ESC >			
Keyclick off	ESC <			
Sound the bell	CTRL G	CTRL G	CTRL G	CTRL G
Copy print on	ESC @	ESC @	CTRL R	CTRL R
Copy print off	ESC A	ESC A	CTRL T	CTRL T
Transparent print on	ESC ‘	CTRL R	ESC 3	ESC 3
Transparent print off	ESC a	CTRL T	ESC 4	ESC 4
Bidirectional print on	CTRL R			
Bidirectional print off	CTRL T			

[1]Terminal recognizes **boldface** commands only during enhanced mode.

Command Set Summary[1]
Table G-1 (continued)

Command	ADM3A/5	1410/1500[2]	QVT-101
Clear			
All to nulls	**ESC ***		ESC *
Unprotected to h.i. spaces			ESC ,
Erase			
Line to spaces	ESC T	~ CTRL O	ESC T
Line to nulls			ESC t
Page to spaces	ESC Y	~ CTRL X	ESC Y
Erase			
Page to h.i. spaces		~ CTRL W	
Page to nulls			ESC y
Insert character	**ESC Q**		ESC Q
Delete character	**ESC W**		ESC W
Insert line	**ESC E**	~ CTRL Z	ESC E
Delete line	**ESC R**	~ CTRL S	ESC R
Enable keyboard	CTRL N **ESC "**	~ CTRL F	ESC "
Disable keyboard	CTRL O **ESC #**	~ CTRL U	ESC #
Sound the bell	CTRL G	CTRL G	CTRL G
Copy print on	CTRL R	**CTRL R**	ESC @
Copy print off	CTRL T	**CTRL T**	ESC A
Transparent print on	**ESC @**	**ESC ***	CTRL R
Transparent print off	**ESC A**	**ESC /**	CTRL T

[1]Terminal recognizes **boldface** commands only during enhanced mode.
[2]Start commands prefaced by tilde (~) with ~ or ESC as lead-in character.

Command Set Summary[1]
Table G-1 (continued)

Command	905	910	VP A2	ADDS 25
Page print				
Formatted	ESC P	**ESC P**	**ESC X**	
Unformatted	ESC L	**ESC L**	**ESC x**	
Light background	ESC b			
Dark background	ESC d			
Set visual attribute	ESC G n	ESC G n	ESC 0 n	**ESC 0 n**
Toggle reverse/ normal video				
Set tag bit			CTRL N	
Reset tag bit			CTRL O	
Half intensity on	ESC)	ESC)	ESC 0 n	**ESC)**
Half intensity off	ESC (	ESC (	ESC 0 n	**ESC (**
Set cursor attribute	ESC . n			
Toggle cursor on/off		ESC .		**ESC .**
Cursor on			CTRL X	**CTRL X**
Cursor off			CTRL W	**CTRL W**
Screen on	ESC n		**ESC d**	
Screen off	ESC o		**ESC D**	
Self test	ESC V	ESC V		**ESC V**
Protect mode on	ESC &	**ESC &**		
Protect mode off	ESC '	**ESC '**		
Graphics mode on	ESC $	**ESC $**	**ESC 1**	
Graphics mode off	ESC %	**ESC %**	**ESC 2**	
Monitor mode on[2]	ESC U	ESC U CTRL 1	CTRL 1	CTRL 1
Monitor mode off[2]	ESC X ESC u	ESC X ESC u CTRL 2	CTRL 2	CTRL 2

[1]Terminal recognizes **boldface** commands only during enhanced mode.
[2]CTRL 1 and CTRL 2 from keyboard only.

Command Set Summary[1]
Table G-1 (continued)

Command	ADM3A/5	1410/1500[2]	QVT-101
Page print			
Formatted			ESC P ESC N
Unformatted			ESC L
Set visual attribute		**~ CTRL G n**	ESC G n
Toggle reverse/ normal video	ESC G		
Set tag bit			
Reset tag bit			
Half intensity on	ESC)	~ CTRL Y	ESC)
Half intensity off	ESC (	~ CTRL _	ESC (
Set cursor attribute			ESC . n
Toggle cursor on/off	**ESC .**		
Self test	**ESC V**		ESC V
Protect mode on	**ESC &**		ESC &
Protect mode off	**ESC '**		ESC '
Graphics mode on	**ESC $**		ESC $
Graphics mode off	**ESC %**		ESC %
Monitor mode on[3]	CTRL 1 ESC U	CTRL 1	CTRL 1 ESC U
Monitor mode off[3]	CTRL 2 ESC X ESC u	CTRL 2	CTRL 2 ESC X ESC u

[1]Terminal recognizes **boldface** commands only during enhanced mode.
[2]Start commands prefaced by tilde (~) with ~ or ESC as lead-in character.
[3]CTRL 1 and CTRL 2 from keyboard only.

Command Set Summary[1]
Table G-1 (continued)

Command	905	910	VP A2	ADDS 25
Display single control character		ESC F n	**ESC Z n**	ESC Z n
Autoscroll mode on	ESC w			
Autoscroll mode off	ESC v			
Scroll mode on/off		ESC H		**ESC H**
Block mode	ESC B	**ESC B**	**ESC t**	
Conversational mode	ESC C	**ESC C**	**ESC T**	
Local edit on	ESC k			
Local edit off	ESC l			
X-On/X-Off on	CTRL O			
X-On/X-Off off	CTRL N			
Calculation mode	ESC z			
Send				
Unprot. line	ESC 4	**ESC 4**		
Unprot. page	ESC 5	**ESC 5**		
Entire line	ESC 6	**ESC 6**		
Entire page	ESC 7	**ESC 7**		
Unprot. message	ESC S	**ESC S**		
Entire message	ESC s			
Terminal ID	ESC M			
One character		ESC M		
Send answerback	CTRL E	CTRL E	CTRL E	CTRL E
Load function key	**ESC | p1 p2 <msg> CTRL Y**	**ESC | p1 p2 <msg> CTRL Y**	**ESC | p1 p2 <msg> CTRL Y**	**ESC | p1 p2 <msg> CTRL Y**
Reprog. send delimiters	ESC x Ps p1 p2			
Reprog. print terminator	ESC p Ps			

[1]Terminal recognizes **boldface** commands only during enhanced mode.

Command Set Summary[1]
Table G-1 (continued)

Command	ADM3A/5	1410/1500[2]	QVT-101
Display single control character	**ESC F n**		ESC F n
Scroll mode on/off	**ESC H**		ESC H
Block mode			ESC B
Conversational mode			ESC C
Send			
Unprot. line			ESC 4
Unprot. page			ESC 5
Entire line			ESC 6
Entire page			ESC 7
Unprot. message			ESC S
One character		~ CTRL T	
Send answerback	CTRL E	CTRL E	CTRL E
Load function key			ESC | p1 p2 <msg> CTRL Y
Reprog. send delimiters			ESC x Ps p1 p2

---

[1]Terminal recognizes **boldface** commands only during enhanced mode.
[2]Start commands prefaced by tilde (~) with ~ or ESC as lead-in character.

Command Set Summary[1]
Table G-1 (continued)

Command	905	910	VP A2	ADDS 25
Load 25th line	ESC f			
Display msg. line	ESC g			
Status line off		**ESC {**	**ESC B**	
Hide msg. line	ESC h			
Status line on		**ESC }**	**ESC b**	
Nonvolatile reset	ESC ~ 1			
Default reset	ESC ~ 0			
Save current values in NVR				
Function key default reset	ESC ~ 2			

[1]Terminal recognizes **boldface** commands only during enhanced mode.

Command Set Summary[1]
Table G-1 (continued)

Command	ADM3A/5	1410/1500[2]	QVT-101
Status line off	**ESC {**	**~ CTRL N**	ESC {
Status line on	**ESC }**	**~ CTRL P**	ESC }
Nonvolatile reset			ESC ! 0
Default reset			ESC ! 1
Save current values in NVR			ESC ! 2

[1]Terminal recognizes **boldface** commands only during enhanced mode.
[2]Start commands prefaced by tilde (~) with ~ or ESC as lead-in character.

APPENDIX H WORDSTAR COMMANDS

Key	Command Unshifted		Shifted	
HOME	^QE	Top of screen	^QR	Beginning of file
DOWN	^X	Down line	^Z	Up line
UP	^E	Up line	^W	Down line
LEFT	^S	Left character	^A	Left word
RIGHT	^D	Right character	^F	Right word
TAB (main)	^I	Tab right	^QD	Right end line
TAB (kypad)	^I	Tab right	^QK	Block end
BACK TAB	^QS	Left side screen	^QB	Block beginning
PAGE	^C	Up screenful	^R	Down screenful
CLEAR	^QX	Bottom of screen	^QC	End of file
CHAR INSERT	^V	Insert on/off	^QP	Previous position
CHAR DELETE	^G	Delete character	^T	Delete word right
LINE INSERT	^N	Carriage return	^KH	Hide/display block
LINE DELETE	^Y	Delete line	^KV	Move block
LINE ERASE	^QY	Delete to end of line	^Q DEL	Delete to beg. of line
PAGE ERASE	^KY	Delete block	^KC	Copy block
CE	^U	Interrupt	^KJ	Delete file
PRINT	^PB	Boldface beg./end	^PS	Underscore beg./end
SEND	^KW	Write block to file	^KR	Read file into text
F1	^OL	Left margin set	^OR	Right margin set
F2	^OI	Tab set	^ON	Tab clear
F3	^B	Reform paragraph	^OC	Center line
F4	^OS	Line space setting	^OG	Paragraph tab
F5	^KB	Mark block beg.	^KK	Mark block end
F6	^QF	Find string	^QA	Find & replace
F7	^L	Find/replace again	^QV	Start of last find/replace
F8	^JH	Set help level	^QQ	Repeat next command
F9	^QZ	Continuous up scroll	^QW	Continuous down scroll
F10	.HE	Heading	.FO	Footing
F11	.PA	New page	^PD	Double strike beg./end
F12	^PV	Subscript beg./end	^PT	Superscript beg./end
F13	^OJ	Justification on/off	^OW	Word wrap on/off
F14	^K0-9	Set/hide marker 0-9	^Q0-9	To marker 0-9
F15	^KD	Save, done edit	^KX	Save, exit to system
F16	^KS	Save and resume	^KQ	Abandon edit

APPENDIX I CALCULATOR MODE

Calculator mode lets you do simple calculations at the terminal, much like a desktop calculator. To enable calculator mode:

1. Type ESC z on the keyboard. If the terminal is in a conversational mode (full or half duplex), press LOC ESC instead of ESC.

2. A blank status line appears on the screen's 25th line. Enter up to six digits (from either the keyboard or the numeric keypad), type an operand (+, -, * or /), enter another set of up to six digits, and type =. The answer will be a maximum of six digits.

3. To erase an entry, press RETURN on the keyboard or ENTER on the keypad.

4. Press ESC to leave calculator mode. Then send ESC h to the terminal to return to the previous 25th line display.

EXAMPLES

Addition To add 123456 and 123456:

Type: 123456 + 123456 =
Answer: 246912

If the answer is greater than six digits, the status line displays OVERFLOW.

Subtraction To subtract 123456 from 246912:

Type: 246912 - 123456 =
Answer: 123456

Subtracting a larger number from a smaller number results in a negative answer.

Multiplication To multiply 123456 by 2:

Type: 123456 * 2 =
Answer: 246912

Division To divide 246912 by 2:

Type: 246912 / 2 =
Answer: 123456

If you divide by zero, the screen displays ERROR.

Any answer with a decimal is truncated. For example: 4.13 displays as 4.

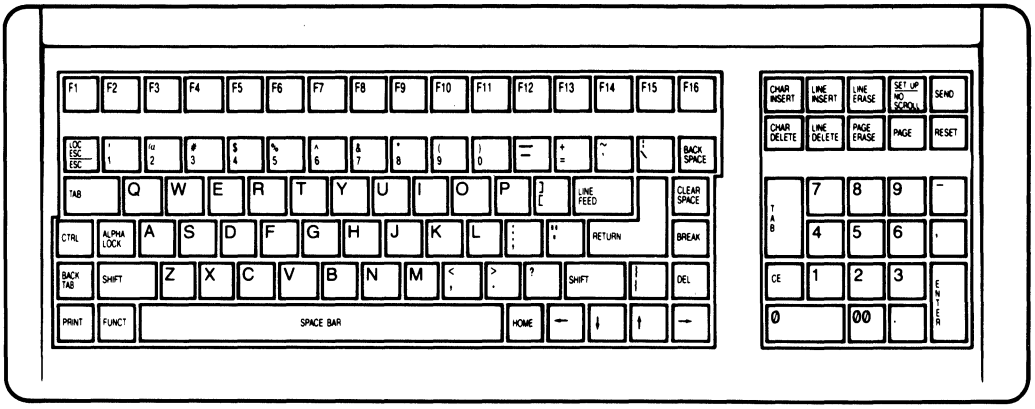
APPENDIX J STATUS LINE MESSAGES

Field	Values	Description
1	STATUS	Title
2	905/910/ HZTN/VPA2/ ADDS/ADM5/ Q101	Current code compatibility mode
3	TBSY	Receive buffer full
4	P3ER	Port 3 error: Invalid voltage level on main port connector pins 6 (DSR) and 8 (DCD) (Disconnect the pins.)
5	PBSY	Receiving X-Off or lowered voltage on DTR line from printer
6	KLOK	Keyboard locked/unlocked (blank)
7	PROT	Protect mode on/off (blank)
8	GRAF	Graphics mode on/off (blank)
9	MONT	Monitor mode on/off (blank)
10	FDX/ HDX/BLK	Communication mode
11	SEND	Block send in progress
	PRNT	Page print in progress
12	HOLD	NO SCROLL key engaged (screen updating halted)
13	blank	
14	blank	

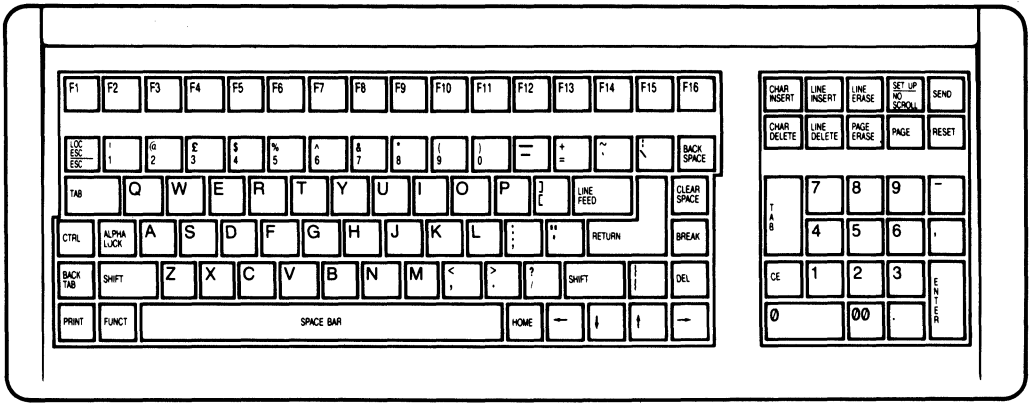
APPENDIX K FOREIGN CHARACTER SETS

Character Set Comparison
Table K-1

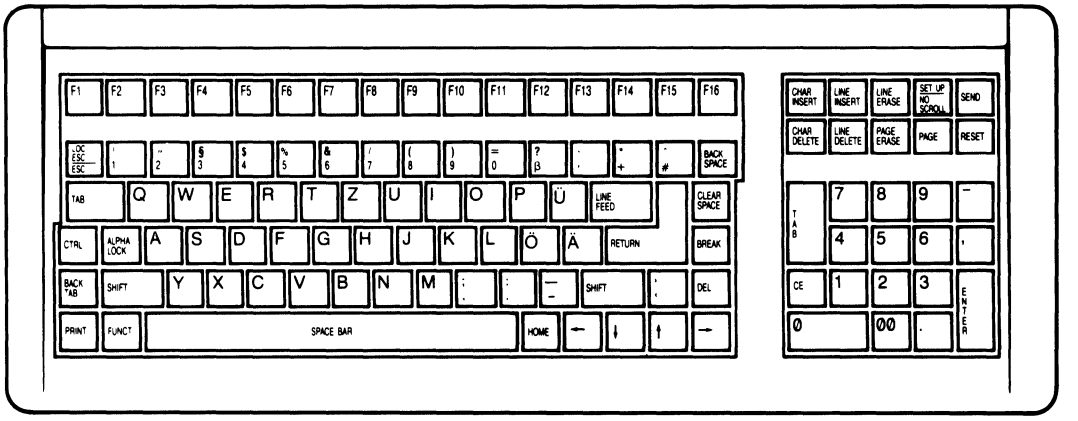
HEX CODE	23	40	5B	5C	5D	5E	60	7B	7C	7D	7E
US ASCII	#	@	[	\	]	^	`	{	|	}	~
U.K.	£										
GERMAN		§	Ä	Ö	Ü			ä	ö	ü	ß
FRENCH	£	à	°	ç	§	^	ê	é	ù	è	¨
SPANISH			¡	Ñ	¿		´	°	ñ	ç	
NORWEGIAN		¨	Æ	Ø	Å		´	æ	ø	å	~
FINNISH			Ä	Ö	Å			ä	ö	å	
ITALIAN	£	à	ò	#	§		@	é	ù	è	ì



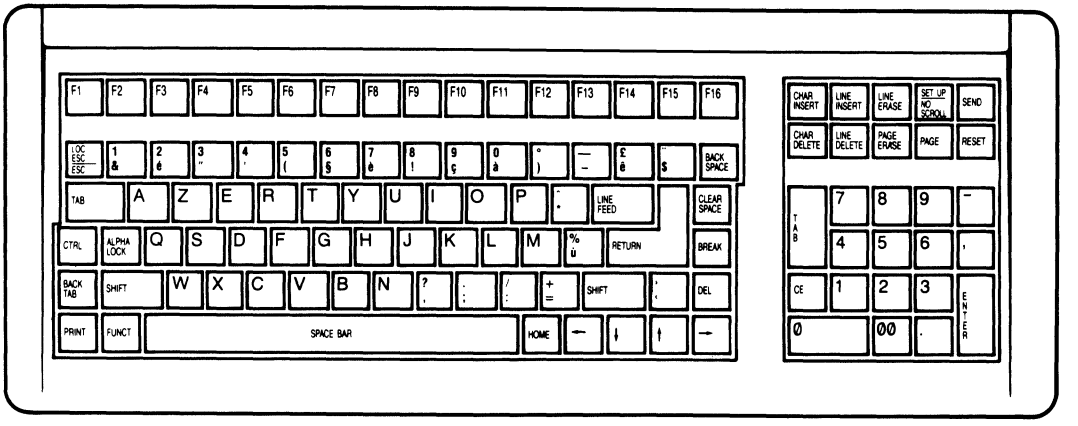
U.S. ASCII Keyboard Layout
Figure K-1



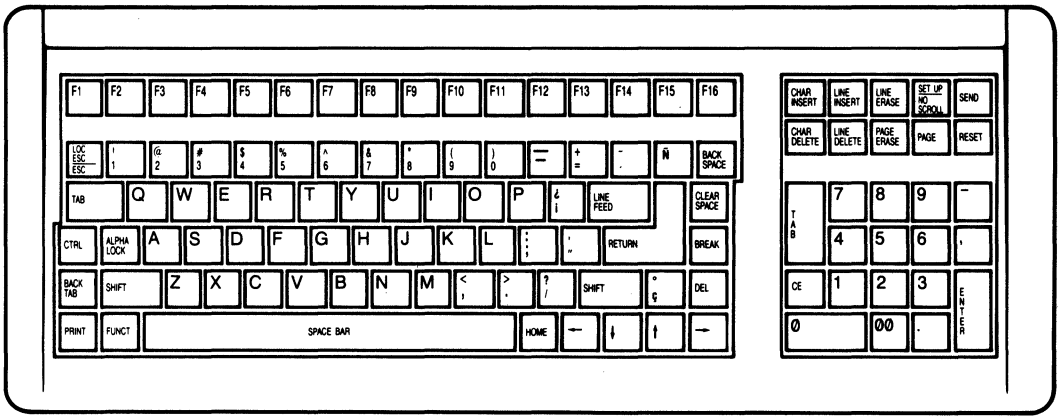
U.K. Keyboard Layout
Figure K-2



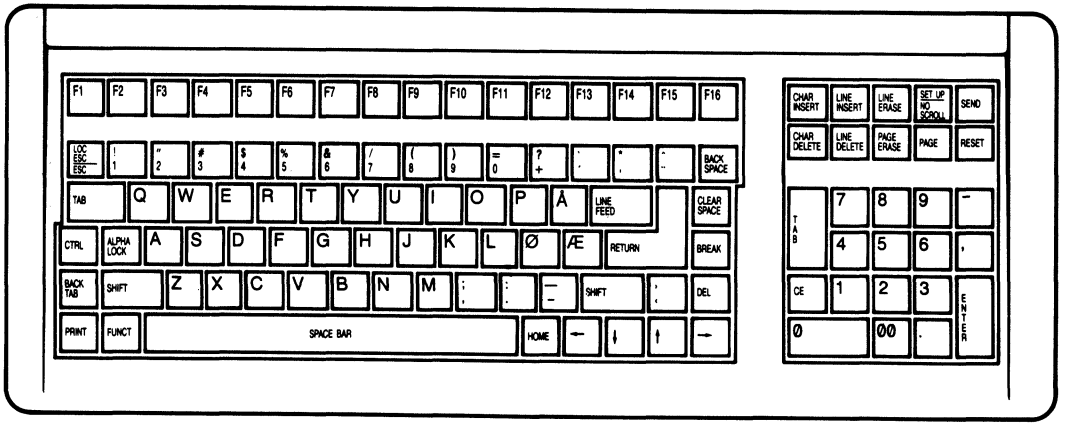
German Keyboard Layout
Figure K-3



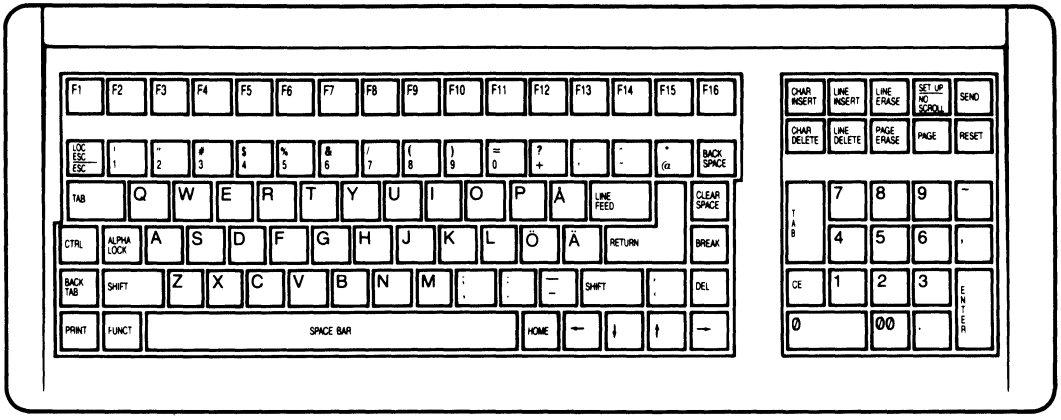
French Keyboard Layout
Figure K-4



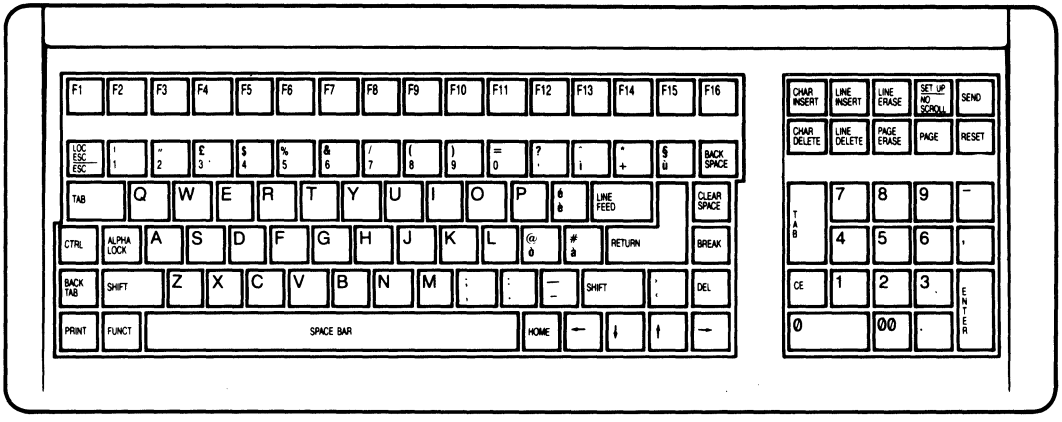
Spanish Keyboard Layout
Figure K-5



Norwegian Keyboard Layout
Figure K-6



Finnish Keyboard Layout
Figure K-7



Italian Keyboard Layout
Figure K-8

GLOSSARY

accounting-style keypad See **numeric keypad.**

ACK Acronym: **Ack**nowledgement. An ASCII control character (hex 06) commonly used by terminals to signal the end of a page print.

address Noun: A number identifying a unique location in computer memory where information is stored. Similar to a post office box number. Verb: To send something to a particular location. The computer can **address** the cursor to a specific line and column position on the screen.

alphanumeric characters Alphabetic, numeric, and special data symbols. The standard ASCII character set includes 96 alphanumeric characters. See **character, display characters.**

ANSI Acronym: **A**merican **N**ational **S**tandards **I**nstitute. A private organization that sets voluntary data processing standards. Sponsor of the ASCII communication standard and the ANSI X3.64 command standard. See **ASCII.**

answerback A programmable response sent to the computer upon request. Can identify a particular terminal when several terminals are connected to a computer, since each terminal answerback can be unique. If 25 905 terminals are connected to the computer, the fifth 905 terminal could be programmed to reply, "905 5." Answerback codes are also used with modems.

application program A program to accomplish a specific task, such as word processing, financial analysis, or retrieval of corporate data. See **program, software.**

arrow keys The four directional cursor movement keys.

ASCII Acronym: **A**merican **S**tandard **C**ode for **I**nformation Interchange, pronounced **ask**-key. A standard set of characters used in most data transmission applications in the United States. An ASCII character is expressed as a group of 7 bits. The 128 ASCII characters are divided into 96 alphanumeric (display) and 32 control characters. See **alphanumeric characters, control characters.**

attributes See **visual attributes.**

autowrap A mode in which the cursor moves to the beginning of the next line after it reaches the end of the current line during data entry.

background The blank surface of the display, on which characters appear in contrast. The default 905 background is dark, with contrasting light characters.

baud rate The number of binary bits transmitted per second.

bell A noise, often called a "beep," made by the terminal to signal various conditions or operations.

bidirectional A print mode that enables two-way communication between devices attached to the computer and printer ports. Both devices must have the same communication format. See **print mode, communication format.**

bit Acronym: **b**inary digi**t**. A digit in the binary number system, always a one or a zero (meaning yes/no, on/off). It is the simplest unit of stored and transmitted electronic data. A group of bits (usually seven or eight) that represents a character is called a byte. See **byte, character.**

block mode A communication mode that sends text entered from the keyboard only to the screen until you signal the terminal to send it as a block to the computer. See **communication mode.**

break signal A signal sent by the BREAK key that holds the RS-232C Transmit Data line in the **0** state (low) for a set time (such as 250 milliseconds). It does not affect terminal operation and no character appears on the screen. How your computer responds to the signal depends entirely on its programming. A break signal can cause a modem to disconnect. See **RS-232C.**

brightness The quantity of light supplied to all screen pixels, both light (on) and dark (off). See **contrast, intensity, pixel.**

buffer A location in terminal memory for temporary data storage. Data accumulates in the main port or printer port buffer when the terminal or printer receives data faster than it can be processed (often due to operation at different baud rates). See **handshaking protocol, baud rate.**

buffered print Any print mode that stores data in terminal buffer(s) when the computer sends data faster than the printer can process it. See **print mode.**

byte A group of bits (usually seven or eight) representing a character. See **bit, character.**

cable A bundle of insulated wires through which current can pass. The terminal has a power cable running to the power source, interface cables connecting to a computer or modem and printer, and a keyboard cable that connects the detached keyboard.

carriage return The motion of the cursor returning to the beginning of a line. Unlike a typewriter, the terminal carriage return does not include a line feed: the cursor remains on the same line.

character A unique, transmittable data symbol. See **display characters, control character.**

character keys Keys that send display characters to the screen and/or computer. See **display characters.**

character set A group of characters generated and controlled as a unit, such as the alphanumeric characters of a certain language, or the graphic characters available in a terminal.

code 1. The numeric representation (in a system such as binary, decimal, or hexadecimal) of a unit (character) of electronically transmitted data. 2. One or more instructions (commands) in a program, or the characters recognized by the terminal as commands. See **escape sequence, control characters, key code.**

column The number assigned to each cursor position on a line, starting at 1 and increasing in increments of one. In the 905, column numbers run from 1 to 80 columns per line.

communication format The parameters that control data transmission, i.e., communication mode, baud rate, data word structure.

communication mode A terminal operating state that determines how and where the terminal transmits data. See **full duplex, half duplex, conversational, block, local.**

compatibility The ability to read and execute programming commands with the same results.

computer port See **main port**

connector The plug or socket at the end of a cable and at the ports of a computer, terminal, printer, etc. RS-232C interfaces commonly employ a DB-25 connector, which is D-shaped, with 25 pins (male connector) or holes (female connector). See **RS-232C.**

contrast The difference in light level between the light areas (characters and other parts) and dark areas on the screen. In the 905, does not change the brightness of the dark areas. See **intensity, brightness.**

control characters ASCII characters used to send commands, rather than being displayed on the screen. The standard ASCII control characters are in the range of hex 00 to 1F. See **character.**

conversational A communication mode that lets data flow in both directions between communication devices. See **full duplex, half duplex, communication mode.**

copy print A print mode that sends data from the computer to the printer and the screen at the same time. Sometimes called **extension** print. See **print mode.**

CRT Acronym: cathode ray tube. An electronic vacuum tube, like a TV picture tube, that displays images. See **screen.**

CTS Acronym: Clear to Send. A standard RS-232C signal, generally employed in modem communication in response to an RTS signal, that indicates a DCE (such as a computer or modem) is ready to receive data from a DTE (terminal). See **DTE, DCE, RTS, RS-232C, handshaking protocol.**

current loop A method of sending data as 20-milliampere current pulses over a serial line (up to 700 meters). Although usually slower than RS-232C, it permits accurate communication over longer distances. Either the computer or the terminal may be able to supply the current. The configuration chosen (active or passive) depends on whether the terminal or computer is supplying the power. If the terminal supplies the current, configure the terminal current loop for active; if the computer supplies the current, configure the terminal for passive. To determine correct configuration, think of a person holding a garden hose with a nozzle on the end. If the house supplies the water pressure to the hose and the person merely opens the nozzle, the house is the active device and the person is passive device. However, if opening and closing the nozzle causes water to flow from (i.e., suctioned out of) a holding tank within the house, the person is the active device and the house is the passive device.

current page The portion of screen memory currently receiving data from the keyboard and/or computer. Depending on the page size, the entire current page may not be displayed on screen. See **page, screen, display**.

cursor A marker showing where the next character should appear on the screen. Can be blinking or steady, a block or an underline, or invisible.

data Information that can be coded into bits, stored in computer or terminal memory and transmitted between devices.

data word A unit of transmitted data, generally containing a start bit, 7 or 8 data bits, a parity bit (optional) and 1 or 2 stop bits.

DCD Acronym: **D**ata **C**arrier **D**etected. A standard RS-232C signal that indicates whether or not the data carrier in a phone system is active and the device at the other end of the phone line is available. See **RS-232C**.

DCE Acronym: **D**ata **C**ommunications **E**quipment. Equipment that participates in processing or transmitting data (e.g., a computer). A DCE port sends RS-232C signals on certain pins (lines) meant to connect with a DTE port. See **RS-232C, DTE**.

default Preset operating values or instructions, in effect until redefined, to which a unit returns when the redefined values are canceled.

default reset Returning terminal operating values to default state. See **reset.**

delete To eliminate (destroy) data stored in certain memory locations. See **erase.**

delimiter A code (character) that marks (delimits) data. Field, end-of-line, and end-of-text are common delimiter types. See **code.**

descender That part of a lowercase character that hangs below the main body of the character. The tail of the lowercase y is a descender. · A terminal with true descenders (such as the 905) displays the tail below the main line of text.

DIP Switches Acronym: **D**ual **I**n-Line **P**ackage. A panel of very small switches.

display The amount of data that can be viewed on the terminal screen at one time. See **page, screen.**

display characters Characters that can appear on the terminal screen, including alphanumeric and graphic symbols. See **characters, alphanumeric characters, graphics characters.**

DOWN key mode A mode in which the DOWN key sends a line feed code (CTRL J) instead of a cursor down code (CTRL V).

download To copy (read) data from the computer into terminal memory.

DSR Acronym: **D**ata **S**et **R**eady. A standard RS-232C signal indicating when the data coming from the computer is meant for your terminal (or another terminal on a network). See **RS-232C.**

DTE Acronym: **D**ata **T**erminal **E**quipment. Any piece of equipment at which a communication path begins or ends. The pin assignments of a DTE port are designed to connect with a DCE port. See **RS-232C, DCE.**

DTR Acronym: **D**ata **T**erminal **R**eady. A standard RS-232C signal (called the "handshaking protocol") that controls the flow of data between the terminal and the computer or printer by lowering and raising the voltage on pin 20 (the DTR line) of the RS-232C connector. See **handshaking protocol, RS-232C.**

duplex Two-way communication. See **conversational mode, half duplex, full duplex, editing key mode.**

echo To send back received data. For example, in full duplex communication mode, the computer must echo back data it receives from the terminal before that data can be displayed on the screen.

editing keys Keys that send ASCII codes the terminal recognizes as commands to control editing operations, cursor movement, and data transmission. Most, but not all, are affected by editing key mode.

editing key mode A mode that determines the destination of editing key codes. In local editing key mode, key codes affect only data on the screen, even in conversational communication modes. In duplex editing key mode, codes go to the computer (during conversational communication modes).

embedded See **visual attributes.**

EPROM Acronym: **E**rasable, **P**rogrammable **ROM.** A read-only memory chip that can be erased and reprogrammed. See **ROM.**

erase To replace data in certain memory locations with replacement characters. See **delete, replacement character.**

escape sequence A character sequence (programming command) that always starts with the ASCII ESC character (hex 1B), followed by other ASCII characters (display or control). The terminal recognizes the character(s) following ESC as a command, instead of interpreting them as data characters.

ETX Acronym: **E**nd of **T**ext. An ASCII character (hex 03) that marks the end of a block transmission of screen data. See **STX.**

even parity A system in which the sum of the bits in every transmitted data word is always even. See **parity.**

extension print See **copy print.**

factory default Terminal operating characteristics set at the factory. See **default.**

field A group of characters treated as a unit by terminal operation (e.g., write-protected field, set up menu field).

firmware A program embedded on a chip (EPROM) inside the terminal that tells the terminal how to operate. See **program.**

formatted Screen data that includes the delimiters that signal the line ends (CR and LF) and end of the transmission. See **delimiter, page print.**

full duplex A communication mode that lets the terminal and computer transmit and receive simultaneously. Data from the computer is not displayed on the screen unless the computer echoes it back. See **echo, conversational, communication mode.**

full intensity Displaying screen images in all the light available at any contrast setting. See **intensity, contrast.**

full reset An operation that restores the values saved in nonvolatile memory. The same as turning the terminal off and back on. See **reset.**

function keys Keys whose default codes are user-definable (the terminal does not recognize them as commands). Many TeleVideo terminals have reprogrammable function keys.

function key message The default or reprogrammed codes sent by a function key.

graphics characters Non-ASCII display characters for drawing lines, figures, and graphs.

half duplex An interactive communication mode that lets the terminal transmit and receive data in separate, consecutive operations. Key codes go to both the computer and the screen. See **communication mode, conversational.**

half intensity Displaying screen images at only half the light available at any contrast setting. See **intensity, contrast.**

handshaking protocol An agreement between two communicating devices to recognized certain signals as requests to stop and start the flow of data, thus preventing data loss when one device is unable to process data from the other. Protocols can be ASCII control characters (X-On/X-Off) in the data stream or they can be raised or lowered voltage on the RS-232C line dedicated to that purpose (DTR). See **DTR, X-On/X-Off.**

hardware The physical components of a system, such as computer, terminals, cables, printers, modems.

hertz A unit of frequency (of electrical waves) equal to one cycle per second. Abbreviated Hz.

hexadecimal A base 16 numbering system (digits 0-9 and letters A-F). Commonly used to identify ASCII characters and by programmers to indicate locations and contents of computer memory. Abbreviated hex.

home The first character position on the page (line 1, column 1). Pressing HOME moves the cursor to this position.

host The computer that controls the terminal.

insert To add data within existing data, which usually moves right at the point of insertion.

intensity The difference in light level, at any contrast setting, between complete lack of light and total available light. See **full intensity, half intensity, contrast, pixel, brightness.**

interactive A program or system that operates by means of two-way communication between the operator and the system. See **conversational.**

interface An interaction or connection (such as a cable) between devices in a computer system (i.e., the computer and peripherals). See **current loop, RS-232C, RS-422.**

interface cable A cable with connectors that can be plugged into the port connectors of the components in a system, thus linking the various devices. See **connector, RS-232C.**

internal modem A modem built into a digital transmission device such as a computer or terminal. See **modem.**

keyboard An arrangement of keys, similar to a typewriter, on which an operator can enter data and command the terminal.

key code Code sent by a key, such as a display or control character or escape sequence. Not all keys send codes. See **code.**

keypad A functional grouping of keys on the keyboard. The 905 has four keypads: typewriter, numeric, editing, and function key.

line based See **visual attributes.**

load To program information into memory.

local editing key mode See **editing key mode.**

local mode A mode that disconnects the terminal and computer. Keyboard entries go only to the screen. See **communication mode.**

mark parity A system in which the parity bit is always a mark (binary 1). See **parity.**

main port The port through which data flows between terminal and computer. See **port.**

margin bell Bell sound made when the cursor reaches the margin bell column (column 72) when entering keyboard data.

menu A displayed list of values from which an operator can make selections. See **set up.**

message line Contrasting line at the bottom of the screen that does not display screen data. It can display the status or set up lines, the user's message or nothing.

millisecond 1/1000 of a second.

mode An terminal state that affects one or more operating characteristics. For instance, in monitor mode, the terminal displays all characters (including control codes and escape sequences), not just alphanumeric characters. The terminal can be in several modes at the same time, e.g., protect and duplex edit modes.

modem Acronym: **mo**dulator/**dem**odulator) An electronic device that changes digital signals (bits) to analog signals (tones), or vice versa. A modem translates digital signals from a computer to analog signals, which can be sent across telephone wires. The modem at the other end translates the analog signals back to digital signals and passes them on to the other computer.

monitor Hardware: A video screen on which you can see computer output and input.

monitor mode A mode in which the screen displays all ASCII characters (control and alphanumeric) and does not act on command characters.

N-key rollover A keyboard feature that lets you type faster than the keyboard can transmit, without locking up or missing a character. If you strike a series of keys virtually simultaneously, the characters are transmitted in the order the keys are pressed.

nonembedded See **visual attributes.**

nonvolatile memory See **permanent memory.**

nonvolatile reset See **full reset.**

normal operating state The power-on operating state, as opposed to set up mode or monitor mode, for example.

null An ASCII character (hex 00) that occupies no space and is not transmitted.

numeric keypad A separate group of keys laid out like the keys on a 10-key calculator. May contain additional alphanumeric (00, period, comma, hyphen) and special keys (TAB, CE, ENTER).

odd parity A system in which the sum of the bits in every transmitted data word is always odd. See **parity.**

on line Communicating with and controlled by the computer.

operating parameter A value (constant or variable) that determines terminal operating characteristics, such as the speed of data transmission, the status of an operating mode, and operating appearance (dark or light screen background).

operating system A group of programs that work together to control a computer system and oversee the functioning of application programs. See **program.**

page A unit of screen memory, ranging from 24 to 96 lines depending on terminal capability. Since the screen displays 24 lines at a time, you may not see the entire page. See **display, screen.**

page based See **visual attributes.**

page print A print command that sends data on the terminal screen to the printer. Can be formatted or unformatted. See **formatted, unformatted.**

parameter See **operating parameter**

parity A method of checking data words for completeness and accuracy, in which the sending device (terminal or computer) adds an extra bit to each data word. **Odd** or **even** parity means the parity bit makes the sum of the bits in every transmitted word always odd or always even. **Mark** or **space** parity means the parity bit is always a mark (binary 1) or always a space (binary 0). The parity setting of two communicating system units (e.g., computer and terminal) must agree. See **bit, data word.**

partial reset A terminal operation that disables the print mode and write protect and protect modes. It returns to the previously enabled conversational mode, restores communication between terminal and computer (if previously halted), unlocks the keyboard and sounds the bell. It does not clear the screen. See **reset.**

peripheral External equipment connected to a computer. The most common peripherals are terminals, disk drives, printers, modems, and cassette-tape recorders.

permanent memory A storage area, backed up by a battery (e.g., a lithium battery), that retains data even when the terminal loses power. Values chosen in set up are stored in permanent memory.

pin assignment The function of each signal-carrying pin in a connector, such as ground, input, output. See **RS-232C.**

pixel Acronym: **pictures element.** The basic unit (a dot) composing images on a CRT screen. A pixel is either on (light, at full or half intensity) or off (dark). The combination of light and dark pixels creates an image on screen. Each pixel is digitally represented by a bit with a value of 0 (off) or 1 (on). See **resolution, contrast, intensity, brightness.**

port The location at which data goes in and out of the device, usually the physical connector to which interface cables are attached. See **connector, interface.**

print mode A terminal operating state that determines how data from the computer passes through the terminal to the printer. See **copy, transparent, bidirectional.**

printable characters Characters (usually alphanumeric) that appear on screen and can be sent to a printer. See **display characters.**

printer port The port through which data flows between terminal and printer. See **port.**

program A set of commands that specify computer or terminal operations. There are three kinds of programs: firmware, which is burned into the EPROMs that control the system; application, which accomplishes specific tasks; and the operating system, which controls the overall operation of the system, directing the firmware and application programs. See **firmware, application program, operating system, software.**

programming command Escape sequence or control character recognized by the terminal as a command to control it operation. Used in application programs.

programming compatibility See **compatibility.**

protect mode A mode that protects marked data fields from any change and limits ability to transmit protected fields.

RAM Acronym: **R**andom-**A**ccess **M**emory. Temporary (changeable) computer or terminal memory that can be read and written into during normal operation. It is erased (lost) when power to the RAM chip is turned off. RAM is used in all computers to store the instructions of programs being run.

read the cursor Report the cursor position to the computer.

refresh To change or update the screen with new data.

replacement character The character (usually a space) that replaces an erased character. See **delete, erase, space character.**

reprogram To change a terminal value (e.g., key code or operating parameter) by means of a programming command.

reset To return the terminal to a specified set of operating values (default or nonvolatile). See **default reset, full reset, partial reset.**

resolution The sharpness of images on the display, largely dependent on the size and density of pixels in a given area. Characters containing many small pixels have sharper resolution than characters containing only a few large pixels. See **pixel.**

reverse video A screen attribute in which the values of light and dark of characters and background are opposite the default values (i.e., dark characters on a light background if normally characters are light on a dark background). See **visual attributes.**

ROM Acronym: **R**ead-**O**nly **M**emory. A chip containing permanent memory that, after manufacture, can be read but not written to or altered. Used to store permanent instructions.

RS-232C A standard technical specification by the Electronic Industry Association for data sent as voltage pulses over a serial cable at distances up to 50 feet (although shielded wires allow greater length). RS-232C names and defines the functions of the signals transmitted by the cable wires. Appendix D contains a further explanation of RS-232C. See **interface, current loop, pin assignment, RS-422, serial transmission.**

RS-232C port A port that transmits RS-232C signals. See **port, main port, printer port, serial transmission.**

RS-422 A technical specification for high-speed communication between the computer and a peripheral. Sends data faster than RS-232C while allowing the peripheral to be located up to 4,000 feet from the computer. See **interface.**

RTS Acronym: Request to Send. A standard RS-232C signal, generally employed in modem communication, that indicates a DTE (terminal) wishes to send data to a DCE (such as a computer or modem). The standard response signal is CTS. See **DTE, DCE, CTS, RS-232C, handshaking protocol.**

screen The CRT viewing area. The 905 screen has 24 lines of data and one message line on the 25th line. See **display, page.**

screen saver A feature that causes the screen to go blank when no data entry or editing occurs for a fixed time span (15 minutes), thus preventing the display pattern from being burned into the phosphor.

screen updating Data changing on the terminal screen as new data is received from the computer.

scrolling The movement of data up or down on the screen.

self test A procedure by which the terminal (or program or computer) verifies its own operation.

serial transmission Sending data one bit at a time, in sequence, over one wire. See **RS-232C.**

set up A procedure for setting terminal operating characteristics. In the 905, set up is a terminal mode in which operating values, displayed in a series of menus on the message line, can be changed from the keyboard. See **menu, mode, message line.**

software Programs, including operating systems and application programs, that can be loaded into a computer from an external storage device (e.g., floppy diskette or tape). See **program.**

space An ASCII alphanumeric character (hex 20) that occupies a character cell on screen (in which no pixels are lit) and space in terminal memory. Not the same as a null, which looks like a space but does not occupy a position on screen and in memory. The terminal does not transmit null characters. See **null.**

space parity A system in which the parity bit is always a space (binary 0). See **parity.**

special keys Keys that do not send ASCII characters, used for a variety of purposes in controlling the terminal.

status line A line appearing on the 25th (message) line that describes current terminal operating conditions. See **message line.**

start bit The bit that signals the beginning of a data word. See **data word.**

stop bit The bit that signals the end of a data word. It is always a one (1). The terminal can use either one or two stop bits, depending on communication format requirements. See **data word.**

STX Acronym: Start of Text. An ASCII character (hex 02) commonly used to signal that text transmission follows. See **ETX.**

system The computer, its peripheral devices (such as terminals, printers, and modems), and the programs that work together.

tab stop A preset position to which the cursor goes when the TAB key is pressed or the terminal receives the tab command. Tab stops can be added or deleted on command.

temporary memory A storage area for current operating values that does not retain data when the power supply is disconnected or the terminal reset. See **permanent memory.**

time-out blank See **screen saver.**

transmit To send data between one system component (such as the computer) and another (such as the terminal).

transmit delay rate The number of character transmission time periods inserted between each ASCII character in a data stream. Setting a transmit delay rate permits slower data transmission without changing the baud rate.

transparent print A print mode that sends all data received by the terminal to the printer without displaying it on the screen. See **print mode.**

unformatted Screen data that contains no delimiters marking line ends. See **delimiter, page print.**

VDT Acronym: video display terminal. A terminal containing a cathode ray tube on which information received from the computer or keyboard can be displayed. Different than a terminal that uses a printer to display data. Video display terminals include a keyboard, while printer terminals may not.

visual attributes Aspects of the appearance of characters and screen areas, including size, steady or blinking, full or half intensity, visible or blank (invisible), normal or reverse video, and underlined. Visual attributes of characters may be embedded (occupy a character space) or nonembedded (occupy no space) and line-based (effective to the end of the current line) or page-based (effective to the end of the page).

word structure See **data word.**

word wrap See **autowrap.**

write protect mode A mode that writes data to the screen in half-intensity to indicate it will be protected when protect mode is enabled. See **protect mode, half intensity.**

X-On/X-Off A handshaking protocol in which the terminal and computer or printer recognize the ASCII control characters X-On (hex 11) and X-Off (hex 13) as signals to regulate data flow. See **handshaking protocol.**

INDEX

QUICK REFERENCE GUIDE

VERIFYING OPERATIONS

Run the self test	ESC V
Monitor mode on	ESC U
Monitor mode off	ESC X
	ESC u

RESETTING THE TERMINAL

Reset terminal operating values to factory default values	ESC ~ 0
Reset terminal operating values to nonvolatile memory values	ESC ~ 1
Reset function keys to factory default values	ESC ~ 2

KEYBOARD AND BELL

Lock (disable) the keyboard	ESC #
Unlock (enable) the keyboard	ESC "
Enable local editing key mode	ESC k
Enable duplex editing key mode	ESC *l*
Keyclick on	ESC >
Keyclick off	ESC <
Sound the terminal bell	CTRL G

SCREEN APPEARANCE

Turn screen on	ESC n
Turn screen off	ESC o
Light background with dark characters	ESC b
Dark background with light characters	ESC d
Select cursor style	ESC . Ps
Define visual attribute(s)	ESC G Ps
Special graphics mode on	ESC $
Special graphics mode off	ESC %

EDITING MODES

Enable write protect (half-intensity) mode	ESC)
Disable write protect (half-intensity) mode	ESC (
Enable protect mode	ESC &
Disable protect mode	ESC '
Autoscroll mode off	ESC v
Autoscroll mode on	ESC w

CURSOR CONTROL

Line feed	CTRL J
Reverse line feed	ESC j
Move the cursor up	CTRL K
Move the cursor down	CTRL V
Move the cursor right	CTRL L
Move the cursor left (back space)	CTRL H
New line (line feed/carriage return)	CTRL _
Carriage return	CTRL M
Address (send) cursor to row and column	ESC = r c
Read cursor row and column position	ESC ?
Move cursor to home position	CTRL ^

TAB STOPS

Set field (protect mode on) or typewriter (protect mode off) tab stops	ESC 1
Clear typewriter tab stop at cursor location	ESC 2
Clear all typewriter tab stops	ESC 3
Move cursor forward to next typewriter or field tab stop	CTRL I
Move cursor forward to next field tab stop (protect mode on)	ESC i
Move cursor backward to previous typewriter or field tab stop	ESC I key BACK TAB

EDITING DATA

Insert a space character at the cursor position	ESC Q
Insert a line of space characters on the current line	ESC E
Delete character at cursor position	ESC W
Delete current line and replace with space characters	ESC R
Erase unprotected characters from the cursor to end of line; replace with space characters	ESC T
Erase unprotected characters from the cursor to end of line; replace with null characters	ESC t
Erase unprotected characters from the cursor to end of screen; replace with space characters	ESC Y
Erase unprotected characters from the cursor to end of screen; replace with null characters	ESC y
Clear current unprotected tab field and and replace with space characters; return cursor to beginning of field	CTRL X
Clear all characters and replace with null characters (disable protect and write protect modes)	ESC *
Clear unprotected characters and replace with write protected space characters (disable protect mode)	ESC ,
Clear unprotected characters and replace with space characters	ESC ; ESC + CTRL Z
Clear unprotected characters and replace with null characters	ESC :

COMMUNICATING WITH THE COMPUTER

Disable X-On/X-Off; enable DTR line	CTRL N
Enable X-On/X-Off; disable DTR line	CTRL O
Block mode on	ESC B
Return to previous conversational mode (half or full duplex) from block mode	ESC C

SENDING SCREEN DATA IN BLOCK MODE

Reprogram delimiter characters	ESC x Ps p1 p2
Send unprotected characters in cursor line up to and including cursor	ESC 4
Send unprotected screen up to and including cursor	ESC 5
Send entire line of data up to and including cursor	ESC 6
Send entire screen up to and including cursor	ESC 7
Send unprotected data between STX and ETX characters	ESC S
Send all data between STX and ETX characters	ESC s

LOADING AND SENDING MESSAGES

Display the message line	ESC g
Return to the status line	ESC h
Load text into the message line	ESC f <text> CTRL M
Reprogram a function key	ESC | p1 p2 <message> CTRL Y
Send terminal identification	ESC M
Send the answerback message	CTRL E

PRINTING

Buffered copy print mode on	ESC @
Buffered copy print mode off	ESC A
Buffered transparent print mode on	ESC ‘
Buffered transparent print mode off	ESC a
Buffered bidirectional print mode on	CTRL R
Buffered bidirectional print mode off	CTRL T
Print unprotected formatted page	ESC P
Print all unformatted page	ESC L
Define the page print terminator	ESC p Ps

905
905
905

TeleVideo Systems, Inc.

1170 Morse Avenue
P.O. Box 3568
Sunnyvale, CA 94088-3568