TeleVideo®
Display Terminal
Operator's Manual

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TeleVideo Systems, Inc.

TELEVIDEO®
955 VIDEO DISPLAY TERMINAL
OPERATOR'S MANUAL

TeleVideo Document 131969-00-B
11 September 1985

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FCC Class A Warning

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INTRODUCTION

MEET THE 955 TERMINAL

TeleVideo's 955 terminal is designed with quality, dependability, and user convenience in mind. It is fully code compatible with TeleVideo's 925/950 family of terminals, but also offers such innovative features as a high-resolution screen with amber color option, 64 function keys, and two operator information lines.

Built-in Features

TeleVideo's 955 terminal is a "smart" terminal with many built-in features:

    Full 925/950 programming compatibility
    Tilt-and-swivel case
    High-resolution screen
    14-inch, 80/132-column display
    Easy-to-use set up menus
    Switchable space/no-space visual attributes
    Top and bottom operator information lines
    Two sets of 32 programmable function keys
    Reprogrammable editing keys
    Special graphics and multinational character sets

Options

The following options are available:

    RS-422 communication interface
    One or three additional pages of memory
    Tektronix 4010/4014-compatible graphics
    Eight foreign-language character sets
    No-cost amber screen
    20 mA current loop
    Function key overlays
    Blank keycaps
    WordStar(tm)-CP/M(r) EPROM and keyboard overlay

Contact your distributor or TeleVideo's spare parts department to order any options.

USING THIS MANUAL

The first chapters of the manual contain general user
information. Chapters 1 through 3 describe how to install the
terminal, change operating values in the set up menus, and
control the terminal from the keyboard. Chapter 4 lists
troubleshooting procedures and tells you how to obtain
service.

Chapters 5 through 9 are for programmers. They explain how
the terminal operates and all the programming commands.

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

1. INSTALLATION

This chapter tells you how to install the terminal. The end of the chapter summarizes the installation steps.

INSPECTING THE TERMINAL

WARNING! Do not open the terminal case. Opening the case exposes you to potential shock hazards. If you wish to inspect the interior of your terminal, have a qualified technician open the case and discharge the voltage for you.

After you unpack the terminal, keep the shipping carton and packing material in case you move or ship the terminal again.

In the packing carton you should find (in addition to this manual):

    The terminal
    A keyboard
    A coiled keyboard cable
    A power cable.

Inspect the keyboard, cabinet, and video screen for shipping damage. If anything is missing or damaged, contact your distributor or dealer.

SELECTING A GOOD LOCATION

Make sure the site you have chosen for the terminal has 4 inches (10.2 cm) of clearance for ventilation on all sides.

The orientation of the terminal's screen can greatly affect your comfort. Reflections and bright light are the most common causes of eye strain. Choose a site with indirect lighting, away from windows and other sources of bright light, as Figure 1-1 shows.

You can avoid fatigue by selecting furniture whose design is conducive to good working posture and placing the terminal at the correct height. The keyboard should be lower than the terminal screen.

Figure 1-2 shows the ideal relationship between the terminal and the operator.

Figure 1-1
Comfortable Terminal Lighting

WINDOW   WINDOW   WINDOW
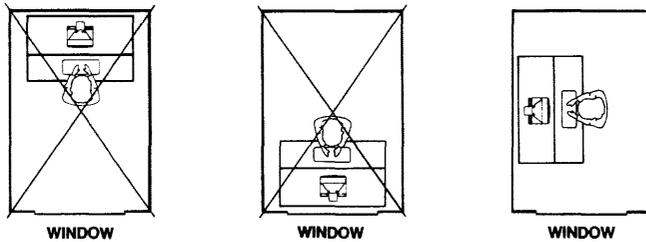
Figure 1-2
Ideal Terminal Placement

INSTALLING THE TERMINAL

NOTE! Tests performed on TeleVideo terminals by Underwriters Laboratories indicate they emit virtually no radiation and pose no health hazard.

Now you are ready to plug in the keyboard and connect your terminal to a computer and printer. Figures 1-3 and 1-4 show front and rear views of the 955 terminal with ports, switches and connectors marked.

Connecting the Keyboard

Plug the ends of the coiled keyboard cable into the front of
the keyboard case and the front of the terminal (Figure 1-3).

Figure 1-3
955 Terminal, Front View

ON/OFF SWITCH

KEYBOARD
CONNECTOR

CONTRAST
ADJUSTOR
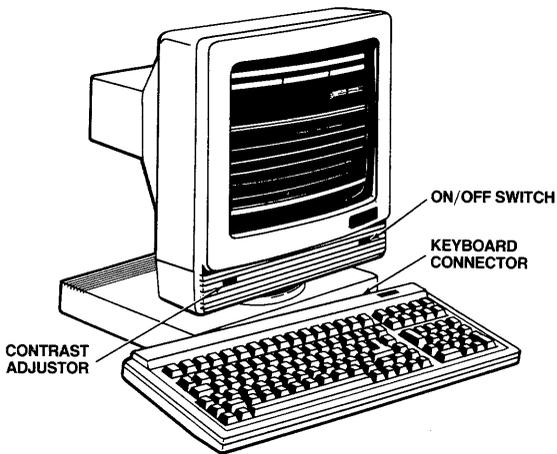
Figure 1-4
955 Terminal, Rear View

POWER CABLE
SOCKET

PRINTER   MAIN   OPTIONAL
PORT   PORT   INTERFACE PORT
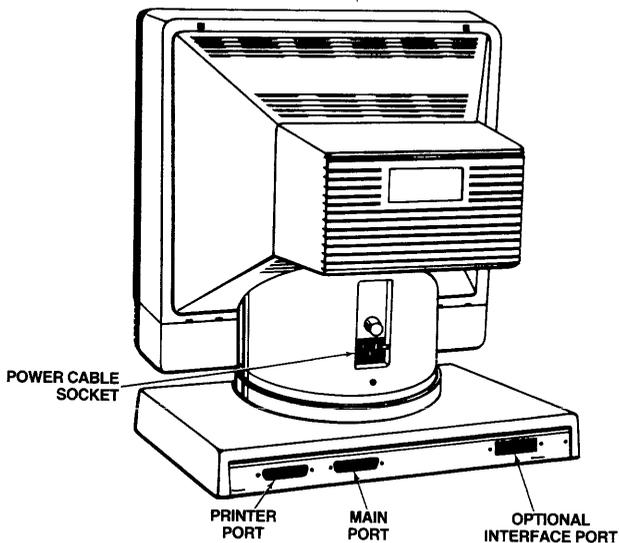
Connecting the Terminal to the Computer System

Before you connect the terminal, make sure its voltage is the
same as your electrical outlet's. Your terminal should carry
a label stating whether its setting is 115 volt or 230 volt
ac power. If you want to change the voltage setting, call the
TeleVideo Customer Service Department for instructions.

Before you connect the terminal to the computer, measure the
distance between them. If the distance is less than 50 feet,
you can use an RS-232C interface (with a 25-pin connector)
between the terminal and the computer.

For distances more than 50 feet, consult your dealer or call
TeleVideo's Peripherals Technical Support Department for help
in selecting the correct interface. See the section on
assistance in Chapter 4 for information about calling
TeleVideo.

If you use the RS-232C interface, follow these steps:

1. Compare the suggested pin connector assignments, listed
    in Table 1-1, with those required by your computer.
    Figure 1-5 shows the terminal's pin connector numbers.
    If necessary, change the interface cable's pin
    assignments (or ask your service technician to do it for
    you).

2. Connect the interface cable to the terminal's main port
    and the computer's RS-232C port.

    NOTE! Not all computers have a one-to-one pin
    compatibility with standard RS-232C pin assignments.
    Typically, pins 2, 3, and 7 are required to transmit data
    between the terminal and the computer. If your computer
    fails to operate properly, call the computer manufacturer
    for assistance in wiring the interface cable.

Figure 1-5
Pin Numbers (25-Pin RS-232 Connector)
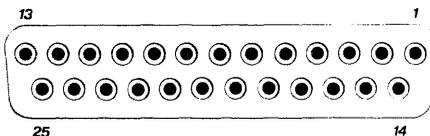
Table 1-1
RS-232C Computer (DTE) Interface Connector Assignments

Pin No.	Signal Name*	Direction
1	Frame Ground	
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	
8	Data Carrier Detect	Input
20	Data Terminal Ready	Output

  *Refer to the EIA's Standard RS-232C for signal definitions.
 **The terminal requires these signals.

Connecting the Terminal to a Printer

1. Check your printer's pin connector against the terminal's
    printer port pin assignments, shown in Table 1-2.

2. Connect an RS-232C interface cable to the printer port
    (Figure 1-4) and to an RS-232C-compatible serial printer.

    NOTE! Not all printers have a one-to-one pin
    compatibility with standard RS-232C pin assignments. To
    transmit data from the terminal to the printer, you need
    only pins 3, 7, and 2 and/or 20. If your printer fails
    to operate properly, call the printer manufacturer.

Table 1-2
RS-232C Printer (DCE) Interface Connector Assignments

Pin No.	Signal Name*	Direction
1	Frame Ground	
2	Receive Data	Input
3	Transmit Data	Output
6	Data Set Ready	Output
7	Signal Ground	
11**	Printer Busy	
20	Data Terminal Ready	Input

  *Reference EIA Standard RS-232C for signal definitions.
 **Nonstandard handshaking signal used by several printers such
   as Epson, Texas Instruments, and Okidata. To use pin 11
   instead of pin 20, call your service technician.

PLUGGING IN AND TURNING ON THE TERMINAL

Now you are ready to plug in the terminal and turn it on.

1. Plug the power cable into the terminal and into a
    grounded wall outlet. See Figure 1-4 for the location of
    the power cable outlet at the rear of the terminal.

    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, ground it with a pigtail.

2. Push the white dot on the ON/OFF switch on the right side
    of the grooved panel below the screen (Figure 1-3).

3. Listen for the terminal's bell, after about a second,
    and look for the cursor in the top left corner of the
    screen after 10 to 15 seconds. If the screen remains
    dark, go to step 5.

4. Adjust the angle of the terminal by pushing on the case
    until you can see the screen easily.

5. Adjust the screen contrast with the roller on the left
    side of the grooved panel below the screen (Figure 1-3).

INSTALLATION SUMMARY

1. Unpack and inspect the terminal.

2. Plug the keyboard cable into the terminal and keyboard.

3. Check that the unit has the correct voltage (115 or 230).

4. Connect the appropriate interface cable between the
    computer system and the terminal.

5. Attach a printer interface cable (if you are connecting a
    printer to the terminal).

6. Plug the power cord into the terminal and wall outlet.

7. Turn on the terminal, listen for the beep, watch for the
    cursor, and adjust the tilt and screen contrast.

Before using the terminal, check its operating values, as
described in the following chapter.

2. SETTING OPERATING VALUES

When you turn on the 905, it is ready to operate. Its **factory default** operating values are set when it is manufactured. This chapter tells how to reset the default values.

NOTE! You can change all set up values with programming comands. See Chapter 5.

HOW SET UP WORKS

To change the 955's operating values, select new values from the set up menus. Each has an instruction line at the top of the screen and a selection line at the bottom to guide you.

Set Up Summary

1. Press SET UP (shifted NO SCROLL). The main menu appears. You can enter set up any time, but if the computer is sending data, the screen stops receiving incoming data until you leave set up.

   NOTE! If the SET UP key has been disabled by a programming command (see Chapter 6), you cannot enter set up. The terminal's bell sounds and the main menu does not appear.

2. Press the UP and DOWN keys to display different set up menus.

3. Press the LEFT and RIGHT keys to move from field to field in each menu.

4. Press the space bar to flip through the values in each field. When the desired value appears, simply move to the next field or menu (or leave set up).

   NOTE! The main menu has action fields. Pressing the space bar triggers the action.

5.   When you finish selecting set up values, press SET UP to
     return to normal operation. The message

                         SAVE?   Y/N

     appears on the screen.

6.   Press **Y** to save your new values in nonvolatile memory.
     If you press any other key, the values you selected are
     lost when you turn the power off or reset the terminal.

Set Up Categories

Table 2-1 describes the 955's six set up categories.

Table 2-1
Set Up Categories

Category	Controls
Main	Access to other menus, plus monitor mode and reset to factory default values.
Main communications (two menus)	Communication with the computer. Some values must match your computer's operating values for proper communication. If you are unsure of the values to select, consult your computer's documentation.
Print communications	Communication with the printer. Some values must match your printer's operating values. If you are unsure of the values to select, consult your printer's documentation.
Screen (two menus)	Screen display characteristics. Some features are a matter of personal preference (such as cursor style), while others should be chosen to suit your application program.
Keyboard (two menus)	Character sets, how certain keys operate, and the codes they transmit.
Programming (two menus)	Loading and sending function key messages; reprogramming the answerback message.

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THE SET UP MENUS

Now you are ready to select your operating values.

Main Menu

Figure 2-1 shows the main menu, and Table 2-2 describes it.

Figure 2-1
Main Menu

MAIN MENU	CURSOR key to move	SPACE BAR to select	SET-UP to exit

MAIN	PRINT	SCREEN	KEY BD	PROGRAM	MONT	DEFAULT

Table 2-2
Main Set Up Menu

Field	Action
MAIN	Displays the first main port category menu
PRINT	Displays the printer port menu
SCREEN	Displays the first screen category menu
KEY BD	Displays the first keyboard category menu
PROGRAM	Displays the first programming category menu
MONT	Normally blank. Enables monitor mode. The terminal displays control characters on the screen but does not act on them.
DEFAULT	Clears the screen and returns all current operating values (volatile and nonvolatile) to factory default.

STOP! Pressing the space bar in this field erases all operating values changed from default. |

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Other Set Up Menus

Figures 2-2 through 2-6 show the set up menus for each category, with the default values of each field (where applicable).

Tables 2-3 through 2-7 describe the selections in each field. Values that must match the operating values of your computer or printer are shown in bold print.

Figure 2-2
Main Port Menus

```
                              MENU 1
 _____
|                                                                        |
| MAIN PORT 1 CURSOR key to move SPACE BAR to change SET-UP to exit       |
| _____ _____ _____ _____       |
~                                                                        ~
|  _____  |
| |          |        |         |        |          |              |     |
| | BAUD 9600| WORD 8 | PRTY NO | STOP 1 | COMM FDX | HAND X-ON    |     |
| |_____|_____|_____|_____|_____|_____|     |


                              MENU 2
 _____
|                                                                        |
| MAIN PORT 2 CURSOR key to move SPACE BAR to change SET-UP to exit       |
| _____ _____ _____ _____       |
~                                                                        ~
|  _____  |
| |         |         |          |          |        |              |    |
| | BSIZ 32 | XDLY NO | XCTR OFF | COMP 950 | DATA 7 | IMDM  OFF    |    |
| |_____|_____|_____|_____|_____|_____|    |
```

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Table 2-3
Main Port Set Up Menus

Field*	Values	Effect
BAUD	50	Selects the speed at which data flows
	75	to the computer through the RS-232C
	110	main (computer) port.
	135	
	150	
	300	
	600	
	1200	
	1800	
	2400	
	3600	
	4800	
	7200	
	9600	
	19.2	
	38.4	
WORD structure	8	Computer port transmits/accepts only 8-bit data words to/from computer.
	7	Computer port transmits/accepts only 7-bit data words to/from computer.
PaRiTY	NO	Terminal does not add or check for parity.
	ODD	Parity is odd (transmitted and received).
	EVEN	Parity is even (transmitted and received).
	MARK	Parity is mark (transmitted).
	SPACe	Parity is space (transmitted).

*Values of fields shown in bold print must match the
computer's values before communication can occur.

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Table 2-3 Continued
Main Port Set Up Menus

Field*	Selections	Effect
STOP bits	1	A bit (always with a value of one) sent to signal that a character has been sent.
	2	Two bits (both ones) sent to signal that a character has been sent.
COMMunication mode	FDX	Permits simultaneous transmission and reception of information. Keyboard entries are sent only to the computer.
	HDX	Sends keyboard entries to the computer and to the screen.
	BLK	Sends keyboard entries to the screen only; permits block transmission to computer. Terminal may receive data from computer.
	LOC	Sends keyboard entries to the screen only. No communication with computer.
HANDshaking protocol	X-ON	Terminal controls the receipt of data with X-On/X-Off signals to the computer.
	DTR	Terminal controls the receipt of data by lowering and raising the voltage on the DTR line to the computer.
	BOTH	Terminal sends X-On/X-Off signals and also changes the DTR line voltage.
	NO	Terminal does not establish hand-shaking signals with the computer.

*Values of fields shown in bold print must match the
 computer's values before communication can occur.

Table 2-3 Continued
Main Port Set Up Menus

Field*	Selections	Effect
Buffer SIZe	16 32 64 128	Selects the receive buffer's fill limit when the terminal sends the X-Off code or lowers the DTR line.
XDLY (transmit delay rate)	NO 1-7	Selects the number of character delays per character transmitted. Does not change the baud rate.
XCTR (transmit control)	OFF	Terminal does not accept X-On/X-Off signals from the computer.
	ON	Terminal accepts X-On/X-Off signals from the computer.
COMP- atibility	950	Terminal commands are 950 compatible. See Table 5-2 for details.
	955	Terminal commands are unique to 955 terminal. See Table 5-2 for details.
DATA	7	Terminal reads only the first seven bits of data words from the computer.
	8	Terminal reads all eight bits of data words from the computer.
IMDM (Internal modem)	OFF	Internal modem is off. Always select this value if no modem is installed.
	ON	Internal modem is on. Turning on the internal modem turns off main port communication.

*Values of fields shown in bold print must match the computer's values before communication can occur.

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Figure 2-3
Print Communications Menu

PRINT PORT	CURSOR key to move	SPACE BAR to change	SET-UP to exit

BAUD 1200	WORD 8	PRTY NO	STOP 1	PMOD	FLIP ON

Table 2-4
Printer Port Set Up Menu

Field*	Values	Effect
BAUD	50 75 110 135 150 300 600 1200 1800 2400 3600 4800 7200 9600 19.2	Selects the speed at which data flows to the printer through the terminal's RS-232C printer port.
WORD structure	8	Printer port sends only 8-bit words to the printer.
	7	Printer port sends only 7-bit words to the printer.

*Values of fields shown in bold print must match the printer's
 values before communication can occur.

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Table 2-4 Continued
Printer Port Set Up Menu

Field*	Selections	Effect
PaRiTY	NO	Terminal does not add or check for parity.
	ODD	Parity is odd (transmitted and received).
	EVEN	Parity is even (transmitted and received).
	MARK	Parity is mark (transmitted).
	SPACe	Parity is space (transmitted).
STOP bits	1	A bit (always a one) sent to signal that a character has been sent.
	2	Two bits (both ones) sent to signal that a character has been sent.
PMOD	blank	No print mode
	TRSP	Turns on transparent print mode. Terminal does not display data on its screen that flows from the main through the printer port. (Existing screen data is undisturbed.) Main and printer port baud rates may differ.
	COPY	Turns on copy (extension) print mode. Terminal sends (copies) all data from the computer to the printer, as well as displaying it on the screen and acting on any commands in the data stream. Main and printer port baud rates may differ.
	BDIR	Turns on bidirectional print mode. Same as copy print (above), but terminal can also pass data from printer to computer.

*Values of fields shown in bold print must match the printer's values before communication can occur.

Table 2-4 Continued
Printer Port Set Up Menu

Field	Selections	Effect
FLIP	ON	If optional memory is installed, screen flips to next page of memory and continues updating when the terminal receives a page print command.
	OFF	When the terminal receives a page print command, the screen stops updating and the current page remains displayed.

Figure 2-4
Screen Menus

MENU 1

SCREEN FORM	CURSOR key to move	SPACE BAR to change	SET-UP to exit

COLM 80	SCRL JUMP	TOP NO	BOTM STAT	WRAP ON	TOB OFF

MENU 2

SCREEN ATTR	CURSOR key to move	SPACE BAR to change	SET-UP to exit

BACK DARK	CURS BBLK	ATTR SPAC	BASE LINE	NORM FULL	STAT REV

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Table 2-5
Screen Set Up Menus

Field	Values	Effect
COLM	132	132 columns per line appear on screen
	80	80 columns per line appear on screen.
SCRL	JUMP	Data scrolls onto the screen at the same rate it comes from the computer.
	NORMal	Scroll rate is 4 lines per second.
	SLOW	Scroll rate is 2 lines per second.
	FAST	Scroll rate is 8 lines per second.
TOP line	NO	Screen's top line is blank during normal operation.
	STAT	Status line appears on the screen's top line.
	USR1	User message 1 appears on the screen's top line.
	USR2	User message 2 appears on the screen's top line.
BOTM line	STAT	Status line appears on the screen's bottom line during normal operation.
	NO	Screen's bottom line is blank.
	USR1	User line 1 appears on the screen's bottom line.
	USR2	User line 2 appears on the screen's bottom line.
WRAP	ON	Cursor wraps to the start of the next line.
	OFF	Cursor does not wrap to the next line.

Table 2-5 Continued
Screen Set Up Menus

Field	Values	Effect
TOB (time out blank)	OFF	Screen remains on, even while terminal is idle.
	10 20 30	When the terminal receives no data for 10, 20, or 30 minutes, screen blanks and the status line displays PRESS ANY KEY TO MAKE SCREEN APPEAR.
BACKground	DARK	Screen background is dark with light characters.
	LITE	Screen background is light with dark characters.
CURSor	BBLK	Cursor is a blinking block.
	SBLK	Cursor is a steady block.
	BUND	Cursor is a blinking underline.
	SUND	Cursor is a steady underline.
	NO	Cursor is not visible.
ATTRibute	SPACe	Visual attributes occupy a space (are embedded) on the screen.
	NOSP	Visual attributes do not occupy a space (are not embedded).
BASE	LINE	Visual attributes affect data from the cursor to the end of the line.
	PAGE	Visual attributes affect data from the cursor to the end of the page.
NORMal	FULL	Normal screen intensity is full. Write protected fields appear in half intensity.
	HALF	Normal screen intensity is half. Write protected fields appear in full intensity.

Table 2-5   Continued
Screen Set Up Menus

Field	Values	Effect
STATus line	REV	Status line appears in reverse visual attribute.
	NORM	Status line appears in normal visual attribute.
	ULIN	Status line appears in underlined visual attribute.
	RLIN	Status line appears in reverse underlined visual attribute.

Figure 2-5
Keyboard Menus

MENU 1

KEY BOARD 1	CURSOR key to move	SPACE BAR to change	SET-UP to exit

CHAR U.S.	KLIK ON	CR CR	DOWN ^/V	EDTK DUPE	REPT ON

MENU 2

KEY BOARD 2	CURSOR key to move	SPACE BAR to change	SET-UP to exit

MBEL OFF	TEST OFF	BRK ENBL	CLR ENBL	ESC ENBL	HZ 60

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Table 2-6
Keyboard Set Up Menus

Field	Values	Effect
CHAR	U.S.	Character set is U.S. ASCII.
	U.K.	Character set is U.K. English.
	FRENch	Character set is French.*
	GERMan	Character set is German.*
	SPANish	Character set is Spanish.*
	FINNish	Character set is Finnish.*
	NORWegian	Character set is Norwegian.*
	ITALian	Character set is Italian.*
KLIK	ON	Most keys click when pressed.
	OFF	Keys are silent when pressed.
CR	CR	Carriage return code causes a carriage return only.**
	CRLF	Carriage return code causes a line feed and then a carriage return.**
DOWN	^/V	DOWN key sends CTRL V (cursor down).
	^/J	DOWN key sends CTRL J (line feed).**
EDTK	DUPE	Editing key codes go to the computer in full or half duplex modes.
	LOCE	Editing key codes go to the terminal only, even in conversational modes.

 *You must install an optional character set EPROM to select
  characters sets other than U.S. or U.K.
**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's documentation.

Table 2-6   Continued
Keyboard Set Up Menus

Field	Values	Effect
REPT	ON	Most keys repeat.
	OFF	No keys repeat.
MBEL	ON	Bell sounds when the cursor reaches the margin bell column (default 72) when entering keyboard data.
	OFF	Margin bell does not sound.
TEST	OFF	Self test does not run on power-on.
	ON	Self test runs on power-up.
BRK	EN	The BREAK key functions when pressed.
	DIS	The BREAK key must be pressed with CTRL to send a break signal.
CLR	EN	The CLEAR SPACE key functions.
	DIS	The CLEAR SPACE key is disabled.
ESC	EN	The ESC key functions.
	DIS	The ESC key is disabled.
HertZ	60	Screen refreshes at 60 hertz (U.S. power systems).
	50	Screen refreshes at 50 hertz (most international power systems).

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Figure 2-6
Programming Menus

```
                            MENU 1
 _____
|                  |                   |                    |             |
| FUNCTION KEY| any F key to select| CE key to reprogram| ENTER key to stop|
|_____|_____|_____|_____|
~                                                                         ~
|                                                                         |
| _____     |
|                 |          |                                        |    |
|  SAVE OFF       | FSET 1   |  F1 = 2 XXXXXXXXXXXXXXXXXXXXX           |    |
|_____|_____|_____|____|
```

```
                            MENU 2
 _____
|                  |                   |                    |             |
| ANSWER BACK| CE key to reprogram| normal key to load |  ENTER key to stop|
|_____|_____|_____|_____|
~                                                                         ~
|                                                                         |
| _____            |
|                                                                         |
|  ANSR = XXXXXXXXXXXXXXXX                                                 |
|_____|
```

Table 2-7
Programming Set Up Menus

Field	Values	Effect
SAVE	OFF	Contents of function keys are not stored in nonvolatile memory. Keys return to factory default values when you turn off power.
	ON	Contents of function keys are stored in nonvolatile (permanent) memory.
FSET	1	Selects function key set one.
	2	Selects function key set two.

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Table 2-7   Continued
Programming Set Up Menus

Field	Values	Effect
FXX	1-16 s1-s16	Pressing any function key (unshifted or shifted) displays its number (1-16 or s1-s16) and contents in the set up menu. Press the CE key to reprogram the function key message destination and contents. **STOP! Pressing CE clears the current destination variable and message.**
1/2/3	1	Message goes to the computer.
	2	Message goes to the terminal.
	3	Message goes to host and terminal.
<message>	XXXXXXXX	Enter a new message (characters or commands) at the keyboard. The keys have a total memory capacity of 256 bytes, which can be distributed any way among the keys. You can enter up to 256 bytes; however, only the first 37 show in the menu line. See Chapter 9 for more instructions on loading the function keys. **NOTE!** If you attempt to load data into a function key when the memory is full, existing messages are destroyed, starting with shifted key F16 and working backward. When all messages are destroyed from key s16 down to the key you are loading, the bell sounds and the terminal does not accept any more data. If you make a mistake, press ENTER, then CE. This restarts the process. Press ENTER to end the loading and leave the field or exit set up.

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Table 2-7 Continued
Programming Set Up Menus

Field	Values	Effect
ANSR =	XXXXXXXX XXXXXXXX	Press the CE key to clear the current answerback message. You can enter any 16 bytes of characters or commands from the keyboard as a new message.
		If you make a mistake, press ENTER, then CE. This starts the process again.
		Pressing ENTER ends the loading. Until you press ENTER, you cannot move out of the field or exit set up.

3. OPERATING THE TERMINAL

This chapter describes the keys and how to operate the terminal from the keyboard. The end of the chapter describes messages that appear in the status line.

THE KEYBOARD

The keyboard contains character keys, editing keys, special keys, and function keys.

NOTE! The names and functions of shifted and unshifted keys are often different. For example, the shifted NO SCROLL key is called SET UP.

If you press a character key for more than one-half second, the key repeats, sending its code again. Most special keys also repeat when held down for more than one-half second. Function keys do not repeat.

Character Keys

The unshaded keys in Figure 3-1 are character keys. They include all alphabetic characters (A through Z), the space bar, numbers (0 through 9), punctuation marks, and symbols.

NOTE! When you press a character key, its code may go to the computer, but not to the terminal's screen, depending on your communication mode. See the section later in this chapter about communication modes.

Figure 3-1
Character Keys
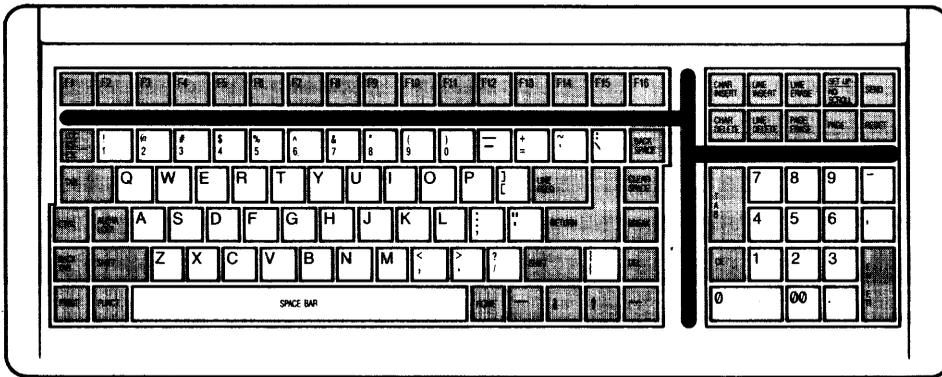
Editing Keys

Editing keys do not display characters. They command the
terminal to do editing operations. Figure 3-2 shows the
editing keys and Table 3-1 describes their operation. Keys
repeat unless noted.

See Table 9-3 and 9-4 for a summary of editing key operations
and codes.

Figure 3-2
Editing Keys
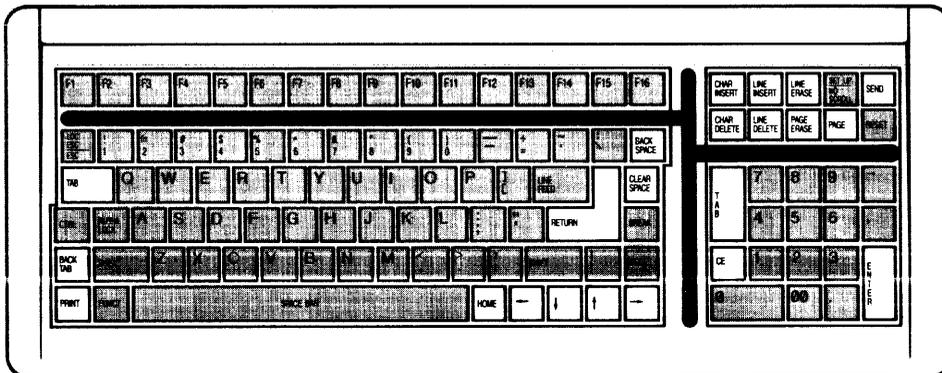
Table 3-1
Editing Keys

Key	Effect
BACK SPACE*	Moves the cursor left one character. Same as 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 (a field tab stop if protect mode is on).
Shifted BACK TAB	Clears the typewriter tab stop at the cursor location.
CE (clear entry)	Replaces all data in the current tab field with replacement 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.
Shifted CE	Clears all typewriter tab stops. Does not repeat.
CHAR DELETE	Deletes the cursor character and shifts all succeeding characters one position to the left until they reach the end of the line or page (depending on the setting of line/page edit mode) or a write-protected field. Adds replacement character(s) at the end of the shifted text.
Shifted CHAR DELETE	Enables replace mode (disables insert mode).
CHAR INSERT	Adds a replacement character at the cursor position, shifting all succeeding characters right one position Shifted characters are lost at the end of the line or page (depending on the setting of line/page edit mode) or at a protected field.
Shifted CHAR INSERT	Enables insert mode (disables replace mode).

*Not affected by editing key mode and not reprogrammable.

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Table 3-1 Continued
Editing Keys

Key
Name   **Effect**

CLEAR   Replaces all unprotected characters on the page with
SPACE   replacement characters.

Shifted   Turns off half intensity and protect mode. Replaces
CLEAR   all data with null characters.
SPACE

LEFT   Moves cursor left one character. Can wrap the
              cursor around to the previous line.

UP   Moves the cursor up one line within the same column
              until it reaches the top line.

Shifted   Reverse line feed. Moves the cursor up to the
UP   previous line within the same column. Once it
              reaches the page's first line, data scrolls down one
              line.

DOWN   Moves the cursor down one line within the same
              column.

Shifted   Same effect as LINE FEED key.
DOWN

RIGHT   Moves the cursor right one position. Can wrap the
              cursor to the next line.

ENTER   Sends a carriage return code to the computer. Does
              not repeat.

Shifted   Sends carriage return and line feed codes. Does not
ENTER   repeat.

HOME   Moves the cursor to the current page's first
              unprotected character position (called **home** position
              and usually column one of line one). Does not
              repeat.

LINE   Removes the current line and shifts lines below it
DELETE   up one line. Fills the last line of the page with a
              line of replacement characters. Ignored while
              protect mode is on.

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Table 3-1 Continued
Editing Keys

Key
Name   Effect

LINE   Replaces data from the cursor to the end of the line
ERASE   or the beginning of the next protected field
            (whichever comes first) with replacement characters.
            With protect mode on, the effect is limited to the
            current field.

Shifted   Replaces data from the cursor to the end of the line
LINE   with null characters. With protect mode on, the
ERASE   effect is limited to the current field.

LINE   Moves the cursor down one line within the current
FEED*   column. Affected by protect mode.

LINE   Adds a line of replacement characters on the cursor
INSERT   line. Data below that line shifts down one line.
            If the cursor is on the page's last line when the
            terminal receives this code, that line is lost. Has
            no effect when protect mode is on.

PAGE   Displays next page of memory (if additional memory
            is installed). Does not repeat.

Shifted   Displays previous page of memory (if additional
PAGE   memory is installed).

PAGE   Replaces unprotected data between the cursor and the
ERASE   end of the page with replacement characters.

Shifted   Replaces unprotected data between the cursor and the
PAGE   end of the page with null characters.
ERASE

PRINT   Prints the current page; replaces special graphics
            and write-protected characters with space
            characters. Sends carriage return, line feed, and
            null characters to the printer after each line.
            Does not repeat.

*Not affected by editing key mode and not reprogrammable.

Table 3-1 Continued
Editing Keys

Key
Name   **Effect**

Shifted   Prints everything on the current page. Pages are
PRINT   unformatted (unless formatted automatically by
            printer) because carriage return, line feed, and
            null characters are not sent to the printer after
            each line. Does not repeat.

RETURN*   Sends a carriage return code to the computer. Does
            not repeat.

SEND   Sends contents of current page to the computer.
            Does not repeat.

Shifted   Sends contents of cursor line to the computer. Does
SEND   not repeat.

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).

Shifted   Sets tab stop at cursor position.
TAB**

 *Not affected by editing key mode and not reprogrammable.
**The unshifted TAB keys on the main keypad and accounting
  keypad are interchangeable: They transmit the same default
  codes and have the same function. However, the shifted TAB
  key on the main keypad transmits the code ESC 1 (set tab),
  while the shifted numeric keypad TAB key functions same as
  the unshifted key.

Special Keys

Figure 3-3 shows the special keys, and Table 3-2 explains
their effect.

Figure 3-3
Special Keys
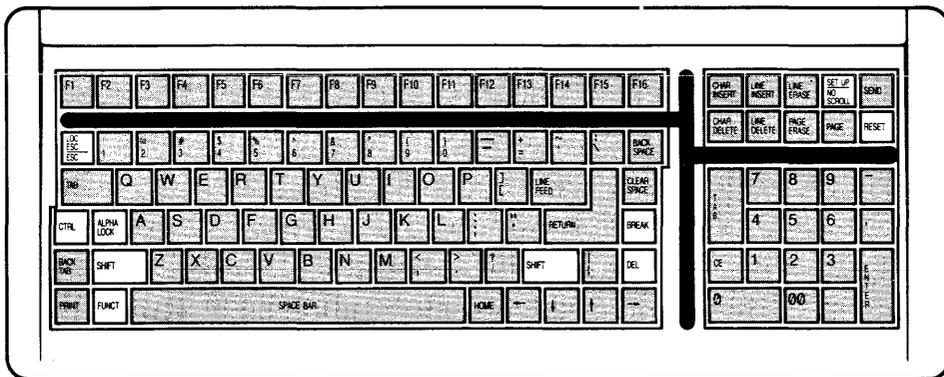
Table 3-2
Special Keys

Key	Effect
ALPHA LOCK	Capitalizes all alphabetic keys, but does not select the upper characters or functions of other keys.
BREAK	Sends a **break signal,** used in programs, when pressed alone (if enabled) or with CTRL (if disabled). May disconnect a modem.
	Partially resets the terminal when pressed with CTRL and SHIFT. See the section in this chapter on resetting the terminal for details.
CTRL	Pressed **with** some character keys to send operating commands (control characters).
	Pressed with other special keys to reset the terminal.
DEL	Has no default function and displays no character. Operation determined solely by application program.
ESC	When pressed **immediately before** pressing a character key, causes the character key to send an operating command (escape sequence).

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Table 3-2 Continued
Special Keys

Key   **Effect**

FUNCT   Pressed with character keys to send a set of codes
              whose operation is determined solely by a program.

LOC ESC   When pressed instead of ESC, sends escape sequences
              from the keyboard to the terminal only.

NO   Halts data coming in to the screen from the computer
SCROLL   until pressed again.

RESET   Resets the terminal when pressed with CTRL.

SET UP   Displays the first set up line. Press again to
(shifted   leave set up lines and save set up values.
NO SCROLL)

SHIFT   Capitalizes letters and selects the upper characters
              or functions of other keys.

Function Keys

The 16 unshifted and shifted function keys at the top of the
keyboard send a set of codes to the computer that programmers
can use. You can program four messages into each key either
in set up or by a programming sequence. See Chapter 9 for
more information about the function keys.

OPERATING THE TERMINAL FROM THE KEYBOARD

This section tells you how to reset the terminal and how to
edit data and send it to the computer and printer.

Resetting the Terminal

To **reset** the terminal, press CTRL RESET. This is the same as
turning the terminal off and back on again. All operating
values return to the last values saved in nonvolatile memory.

Pressing CTRL SHIFT BREAK partially resets the terminal. It
turns off the print mode, write protect, and protect modes;
returns the terminal from block or local mode to the previous
conversational mode; restores communication between the
terminal and the computer (if previously halted); unlocks the
keyboard; and sounds the bell.

Editing and Communication Modes

Before you try to enter data or use the editing keys, you should understand the effects of the terminal's **communication** modes and **editing key** mode.

The 955 has four communication modes:

> Full duplex
> Half duplex
> Block
> Local

When you turn on half duplex or full duplex communication modes (in set up or with a programming command), key codes go immediately to the computer.

In **full duplex** mode, key codes go only to the computer and not to the screen, unless your computer sends back (echos) the key codes or the terminal is in **local editing key** mode (described below). Data does not appear on the screen when you press character keys, and the editing keys do not move the cursor or control screen data.

In **half duplex** mode, the terminal sends key codes to the computer and the terminal's screen. Data appears on the screen when you press the character keys, and the editing keys affect the cursor and screen display.

In **block** communication mode, data goes from the keyboard to the screen. Pressing SEND transmits screen data to the computer. The terminal can receive data from the computer any time.

In **local** communication mode, the terminal has no communication with the computer.

Editing key mode affects only the editing keys. In **local editing** mode, editing key codes go **only** to the screen, even when the terminal is in half or full duplex mode. If you are in full duplex communication mode, you can turn on local editing key mode (in set up or with a programming command) to ensure that the editing keys can control screen data. In **duplex editing** mode, the destination of editing key codes is controlled soley by the communication mode.

See Chapters 6 and 8 for more information about editing key and communication modes.

Editing and Sending Data

The editing keys (Table 3-1) move the cursor, change data on
the screen, and send data to the computer and printer.

NOTE! If the editing keys do not function as described in
Table 3-1, check the terminal's communication and editing key
modes, described in the previous section.

In block mode, the unshifted SEND key sends all data in the
page, from the home position through (including) the cursor
position. See Figure 3-4.

Figure 3-4
Data Sent by the Unshifted SEND Key

HOME   CURSOR
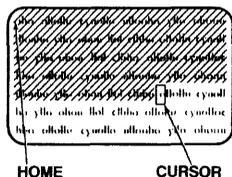
The shifted SEND key sends all data on the cursor line,
starting at the first column position and including the cursor
position. See Figure 3-5.

Figure 3-5
Data Sent by the Shifted SEND Key

CURSOR

1 LINE

DATA SENT BY SHIFTED SEND KEY   DATA NOT SENT
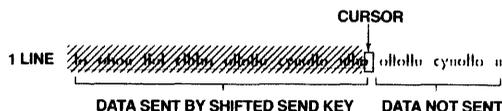
Chapter 9 explains how to reprogram the SEND key.

Pressing the PRINT key prints the contents of the screen. This
is called **page print**. During a page print, the screen does
not accept new data from the computer or keyboard. When the
page print finishes, data again flows onto the screen.

NOTE! If your terminal has more than one page of memory, the
display flips to the second page during a page print and the
screen continues to accept data.

Table 3-4 explains the action of the print key. See Chapter 8 for more information about printing.

Table 3-4
PRINT Key Operation

PRINT Key	**Sends to Printer**
Unshifted	All unprotected characters on the page. Sends space characters for protected characters. Printing is **formatted:** Sends a carriage return and line feed control character after each line.
Shifted	All characters on the page. Printing is **unformatted:** Sends no formatting control characters in the transmission.

SCREEN APPEARANCE

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

The Cursor

The cursor is a contrasting rectangular block or underline (selected in set up) that indicates the position of the next entered character. The cursor can be invisible, steady, or blinking.

You can move the cursor with the UP, LEFT, DOWN, RIGHT, TAB, BACK TAB, HOME, LINE FEED, RETURN, ENTER, or BACK SPACE keys (described in Table 3-1).

Screen Saver

The terminal's screen-saver feature blanks the screen after 10, 20, or 30 minutes (selected in set up or by a programming command) of inactivity. Blanking the screen conserves the phosphor coating inside the face of the screen.

When the screen blanks, the status line displays the message PRESS ANY KEY TO MAKE SCREEN APPEAR.

The Status Line

In normal operation the bottom line displays the status line.
This line summarizes the current operating characteristics.
Many fields are normally blank, and information appears only
when appropriate.

Figure 3-6 shows status line messages, and Table 3-5 lists all
possible messages for each field.

Figure 3-6
955 Status Line

PRC 101001	TBSY	CBSY	PBSY	PMOD	KLOK	PROT
1	2	3	4	5	6	7

GRAF	W.P.	FDX	LINE	SEND	HOLD	message
8	9	10	11	12	13	14
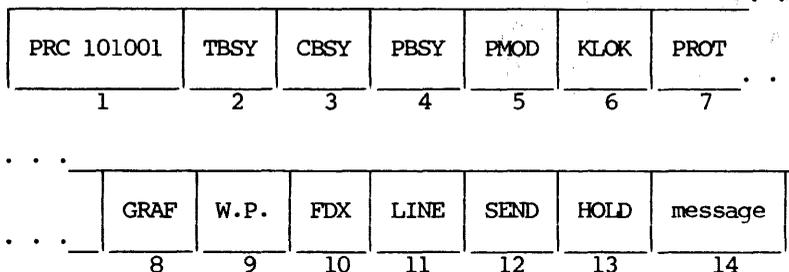
Table 3-5
Status Line Values

Field	Values	Description
1	P R C	P = Page of memory (1-4) R = Row (1-96) C = Column (1-132)
2	TBSY	Terminal busy, displayed when terminal's receive buffer reaches its fill limit.
3	CBSY	Computer busy, displayed when computer sends X-Off to the terminal.
	P3ER	Port 3 error, indicating an invalid voltage level on main port connector pins 6 (DSR) and 8 (DCD). (Disconnect the pins.)
4	PBSY	Printer busy, displayed when terminal receives X-Off from printer or voltage drops on DTR line.

Table 3-5 Continued
Status Line Values

Field	Values	Description
5	mode	Displays terminal print mode or operation: UFPG = Unoformatted page print operation FMPG = Formatted page print operation TRSP = Buffered transparent print COPY = Buffered copy (extension) print BDIR = Buffered bidirectional print
6	KLOK	Keyboard locked/unlocked (blank)
7	PROT	Protect mode on/off (blank)
8	GRAF	Graphics mode on/off (blank)
9	W.P.	Write protect mode on/off (blank)
10	FDX/HDX/ BLK/LOC	Communication mode: full duplex/half duplex/block/local
11	LINE/ PAGE	Line or page edit mode
12	SEND	Displays SEND when terminal is sending data in block mode
13	HOLD	Displays HOLD when NO SCROLL key is engaged (screen updating is halted)
14	message	Displays seven-character user-programmable message.

4. MAINTENANCE AND ASSISTANCE

This chapter tells you what to check before placing a service call. It also shows you how to change the line fuse and obtain assistance.

TROUBLESHOOTING

Before placing a service call, find the symptom in Table 4-1 and try the solution listed there. The last part of this section tells you how to change the line fuse.

Troubleshooting Table

Table 4-1 lists a variety of terminal problems and simple solutions.

Table 4-1
Troubleshooting Terminal Problems

Symptom	Possible Solution
Terminal dead (no bell; no cursor)	Unplug power cord and plug in both ends again
	Check and replace line fuse
	Turn on power switch
	Check power select switch setting
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 set up menu)
	Check the baud rate

Table 4-1   Continued
Troubleshooting Terminal Problems

Symptom	Possible Solution
Terminal does not go on line	Check RS-232C (computer) port interface cables:
	Pins 1 and 7 must be grounded
	Pin 2 must be connected to computer receiver
	Pin 3 must be connected to the computer transmitter
	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's position in modem cradle
Cursor does not appear	Adjust screen brightness
Computer does not respond while on line	Set parity, word structure, and stop bits to match computer's requirements
No keyboard response	Unplug and reattach both ends of keyboard cable
	STOP! This may reset the terminal, which would clear the screen.
	Change to half duplex communication mode
Keyboard locked up	Review all set up line values
	Reset the terminal

Table 4-1   Continued
Troubleshooting Terminal Problems

Symptom	Possible Solution
Printer does not print correctly	Check baud rate, parity and word structure of main port in set up
	Check print mode and command
	Check baud rate, parity and word structure of printer port in set up
	Check printer cable's pin assignments
	Pins 4 and 20 must be driven by +12 volt dc power or disconnected
	Pin 3 must be connected to printer data input
	Pin 2 must be connected to printer data output for operation with X-On/ X-Off control
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 interface from the terminal's computer port; connect computer port's pins 2 and 3; try operating in full duplex
	Try ESC sequences with LOC ESC key
Display is wavy or beep sounds unusual	Change hertz setting

Running the Self Test

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

STOP! Running the self test clears the screen.

1. Press (in sequence):

    SET UP 1

2. Watch for the test screen to appear.

3. Check the screen:

    Four lines should blink.

    All characters should be displayed.

    Each character should be formed properly.

    You should not see any extra dots and no dots should be missing.

    The screen should contain all the visual attributes and some decreased intensity characters.

4. Press **SET UP** to stop the test. You can clear the test from the screen with the CLEAR SPACE key.

Checking the Line Fuse

To check the line fuse:

1. Turn off the power and unplug the terminal's power cord (either from the terminal or from the wall outlet).

2. Remove the fuse holder by unscrewing it counterclockwise (Figure 4-1).

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

    If the thin wire inside the fuse is intact (Figure 4-2), the fuse should be functional. If the thin strip is broken and/or the glass is slightly black (Figure 4-3), 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.)

Figure 4-1
Location of the Line Fuse

LINE
FUSE
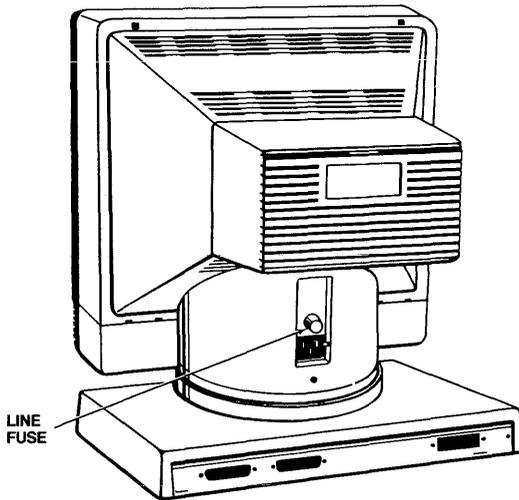
Figure 4-2
Good Fuse
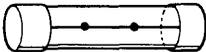
Figure 4-3
Burned-Out Fuse

4.   Replace a blown fuse with a 1.5-ampere, slow-blow fuse for 115-volt applications or a 0.75-ampere, slow-blow fuse for 230-volt applications.

5.   Replace and tighten the fuse holder.

6.   Plug in the terminal power cord.

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

IF YOU NEED ASSISTANCE

TeleVideo's toll-free number for service calls is 800/521-4897 (in California, 800/821-3774). Or call 408/971-0255.

Before calling, check to make sure the terminal is plugged in, all cables are connected to the correct ports, and all operating parameters are set correctly (go back to Chapter 2 if you need to review them).

Ask for the Applications Support Department or the Technical Support Department, depending on your questions. Try to place the terminal by the phone. Have the terminal's serial number, found on the rear of the case, and this manual at hand.

If the line is busy, try again or leave a message with the TeleVideo operator. Your call will be returned as soon as possible.

Applications Support

Ask for the Applications Support Department when you want to know more about a feature, how to use the terminal in a particular environment, or when you need marketing information. Call between 8:30 a.m. and 5:30 p.m., Pacific time, Monday through Friday (except holidays).

Technical Support

Call Technical Support for help with hardware problems or to return the terminal for repair. You can reach the Technical Support Department between 7:00 a.m. and 5:30 p.m., Pacific time, Monday through Friday (except holidays).

Service Under Warranty

The terminal is covered by a limited warranty (see Appendix B). No warranty registration is required. If you need service while the terminal is covered by the limited warranty, call the Technical Support Department.

Shipping the Terminal

Should you need to ship the terminal, ask your service technician to 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 955

The following chapters are for programmers. They explain the
commands that let you control the terminal in a computer
program or from the keyboard.

The terminal responds to a wide range of commands you can
include in your programs. Turn to the Quick Reference Guide
at the back of the manual for a summary of commands.
Incorporating these commands in your programs can make your
job faster and easier.

The terminal's editing keys transmit the same codes as certain
programming commands. Many programs using the terminal's
built-in features can be made interactive. You can write a
program that calls on the operator to press an editing key to
attain certain results.

If you want to change the function of any editing key to suit
your particular application, you can reprogram the key, or
keys. See Chapter 9 for instructions on how to reprogram
editing keys.

We hope you take advantage of the terminal's many features to
help you in all your programming and data handling jobs. If
you have any questions or problems this manual cannot answer,
TeleVideo's Technical Support personnel are ready to assist
you by telephone.

ENTERING COMMANDS

Programming commands cause the terminal to perform an
operation, such as moving the cursor, sending the contents of
the screen to the printer, or changing an operating mode. You
can send them from the host or enter them at the keyboard.

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

Command Descriptions

Command descriptions in this manual have up to five elements.
Table 5-1 lists each element and its meaning.

Table 5-1
Command Elements

Element	Meaning
Statement	Function of the command
Keyboard entry	How the command is entered at the keyboard (escape sequence or control code)
Key	Key (if any) that sends the same code and performs the same function
DEFAULT =	Terminal's factory default state (if applicable)*
SET UP	Function or value can also be selected in set up mode (if applicable)

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 terminal's **factory default** state is not necessarily the
  same as the **default value** of a command. If you enter a
  command without its variable, the command **defaults** to the
  lowest variable value (zero or one). The resulting state or
  function may not be the factory default condition.

Using Commands in Your Programs

The 955 terminal responds to control codes and escape
sequences regardless of your programming language's 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 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

To make sure the terminal receives commands from the keyboard, put the terminal in local or block communication mode. Then the terminal responds to commands from the keyboard, and no commands go to the computer.

If the terminal is in a conversational communication mode, commands go to the computer. How your computer then acts on them depends on your program.

You can send escape sequences to the terminal during a conversational communication mode by entering the commands with the LOC ESC key instead of ESC.

When you enter commands at the keyboard, make sure the ALPHA LOCK key is not locked. Enter the characters exactly as shown so the commands work as described. Notice whether the command requires an upper- or lowercase character, a number **one** or a lowercase **L**, a **zero** or an uppercase **O**.

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.

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.

VERIFYING OPERATIONS

Self Test

Run the self test   **ESC V**

This command starts the self test described in Chapter 4. If you send this command while the terminal is in set up mode, nothing happens. After you run the test, you can clear the screen by pressing the CLEAR SPACE key or sending a clear command (described in Chapter 7).

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

Monitor Mode   SET UP
                                                   DEFAULT = Off
Monitor mode on   ESC U
Monitor mode off   ESC X
                                              or ESC u

Mode on The terminal displays command characters (control
characters and escape sequences) 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 easily debug a
program.

Appendix D shows how control characters appear in monitor
mode. For example, the ASCII character SOH (entered as CTRL A
in the program) appears on the screen during monitor mode as S
with a subscript H. Escape sequences include an E with a
subscript C for the ESC character. And a null character
appears as N subscript L.

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

Figure 5-1
Typical Monitor Mode Display
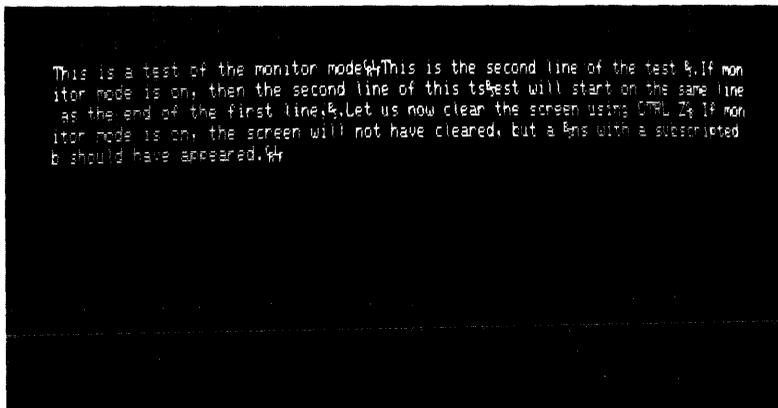
CHANGING OPERATING VALUES

Chapter 2 shows how to change the terminal's operating values in a series of set up menus and then save the new operating values in the terminal's nonvolatile memory. This section explains the commands that let you change many set up values.

Changing set up values with a command only saves the new values in temporary memory. This section also gives the commands to save current set up values in nonvolatile memory and to return to nonvolatile memory or factory default values.

Terminal Operating Modes	SET UP
Set terminal operating mode(s)	ESC [= Ps h
Reset terminal operating mode(s)	ESC [= Ps l

Ps	Mode	Set	Reset
0	Transmission control	On	Off*
1	Data word	8 bits	7 bits*
2	Attribute base	Page*	Line
3	Columns per line	132	80*
4	Margin bell	On	Off*
5	Normal intensity	Half	Full*
6	New line	LF/CR	CR*
7	Autowrap	On*	Off
8	Auto repeat	On*	Off
9	DOWN key	CTRL J	CTRL V*
10	Function key	Nonvolatile*	Temporary
11	SET UP key	Enabled*	Disabled
12	ESC key	Enabled*	Disabled
13	CLEAR SPACE key	Enabled*	Disabled
14	BREAK key	Enabled*	Disabled
15	Page print flip	On*	Off
16	Screen refresh rate	50 Hz	60 Hz*

*Factory default setting.

Operating mode commands are in pairs: One sets (enables) the function and the other resets (disables) it. You can set or reset operating modes singly or in strings, separating the Ps values by semicolons.

You can also change all these modes in set up. Changing them with a command does not save the new value in nonvolatile memory.

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Operating modes affect how the terminal responds to action commands or codes from operating keys. Each mode is described in the section that contains other related commands. See the table of contents and index for specific subjects.

Variable Operating Values   **SET UP**

Select a terminal operating value   **ESC [p1 ; p2 v**

>   **p1   Terminal Function**
>
>   0   Transmit delay rate
>   1   Handshaking protocol
>   2   Receive buffer fill limit
>   3   Status line attribute
>   4   Top information line
>   5   Bottom information line
>   6   Scroll rate
>   7   Function key set
>   8   Screen saver time
>   9   Character set
>   10   Programming compatibility mode
>
>   **p2 = An operating value variable for each p1 function.**

This set of commands lets you change terminal operating values while running a program. You can also change all these values in set up. Changing them with a command does not save the new value in nonvolatile memory.

Each terminal function is described in the section that contains other related commands. See the table of contents and index for specific subjects.

Saving Operating Values

Save current set up values in nonvolatile   ESC [0 ; 1 }
memory

This command saves in nonvolatile memory the current settings of the modes and operating values you can change both in set up and by an operating command. It does not affect modes and values (such as protect mode) you cannot change in set up.

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Programming Compatibility Mode

Select programming compatibility mode

SET UP
DEFAULT Ps = 1
ESC [10 ; Ps v

Ps	Terminal
0	955
1	950

This mode changes the operation of certain commands. Table 5-2 lists the commands and how they are affected.

**Table 5-2
Effects of Compatibility Mode**

Command	955 Mode	950 Mode
ESC | p1 p2 <message> CTRL Y	Reprogram function keys using unique 955 p1 values	Reprogram function keys using 950 p1 values
ESC 0 Ps p1 p2 p3	Reprogram any one editing key with any three bytes	Reprogram the SEND key with one of six send commands
ESC +	Clear all to replacement characters (reset protect and write protect modes)	Clear unprotected to replacement characters (do not reset protect and write protect modes)
ESC ,	Clear unprotected to write protected space characters (reset protect mode)	Clear unprotected to write protected space characters (do not reset protect mode)
ESC G Ps	Designating an embedded attribute when the cursor is in a protected field moves the cursor to the next unprotected position and then changes the attribute.	Designating an embedded attribute when the cursor is in a protected field changes the attribute at the cursor position and destroys the character in that position.
ESC M	Terminal returns 10-byte identification 955<sp>R.0,m<CR>	Terminal returns 6-byte identification R.0,m<CR>

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Changing the Screen Refresh Rate

	SET UP
	DEFAULT = 60 Hz
Screen refresh rate is 60 Hz	ESC [= 16 l
Screen refresh rate is 50 Hz	ESC [= 16 h

Some power systems, usually international systems, may require 50 Hz to avoid screen flicker.

Resetting the Terminal

Reset the terminal's operating values to factory default values	ESC ~ 0
Reset the terminal's operating values to nonvolatile memory values	ESC ~ 1 key CTRL RESET
Reset function keys to factory default values	ESC ~ 2
Reset editing keys to factory default values	ESC ~ 3

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 5-3 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.

Table 5-3
Summary of Reset Methods

Command/ Key Sequence	Clears Screen?	Actions
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, editing keys, and answerback code). Unlocks the keyboard.
ESC ~ 2	No	Restores codes sent by function keys to factory default values.
ESC ~ 3	No	Restores codes sent by editing keys to factory default values.
CTRL SHIFT BREAK	No	Turns off print, write protect, and protect modes. Returns the terminal from block or local mode to the previous conversational mode. Restores communication between terminal and host (if previously halted). Unlocks the keyboard and sounds the terminal's bell.
CTRL BREAK or 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.

RUNNING A PROGRAM

Execute a user-installed program   **ESC z**

You can install your own program in external ROM. It must
start at hex address 30 00 and contain less than 8 Kbytes, and
the first byte must be hex 55. If the terminal finds a
program at 30 00 when it receives this command, it jumps to
address 30 01 and executes the program.

6. CONTROLLING THE TERMINAL'S OPERATION

The commands in this chapter let you change many aspects of the terminal's operating appearance. You can control such features as keyboard operation, the terminal's bell, the appearance of the screen and the cursor, the number of columns displayed on the screen, and the terminal's character sets. Many of the features can also be controlled in set up.

KEYBOARD AND BELL

You can control many keyboard and bell features with the commands in this section.

Keyboard Repeat Mode	**SET UP**
	DEFAULT = On
Keyboard repeat on	**ESC [= 8 h**
Keyboard repeat off	**ESC [= 8 l**

Repeat on Keys repeat when pressed for one-half second, except CLEAR SPACE, HOME, SEND, PAGE, CE, ENTER, RETURN, ESC, LOC ESC, DEL and the function keys.

Repeat off No keys repeat.

Locking/Unlocking the Keyboard	
	DEFAULT = Unlock
Lock (disable) the keyboard	**ESC #**
Unlock (enable) the keyboard	**ESC "**

This command **locks** or **disables** most of the keys while running a program. You can use this feature to keep the operator from entering data while the program builds a special form. However, even while the keyboard is locked, the FUNCT, LOC ESC, BREAK, SET UP, NO SCROLL and function keys still operate.

To unlock the keyboard for the operator, send ESC " from the computer. Or the operator can press CTRL SHIFT BREAK, CTRL RESET or LOC ESC ", or turn the power off and back on again. See Table 5-3 for other effects of these resets.

Locking Four Terminal Keys   SET UP
                                                  DEFAULT = Unlocked
Lock (disable) key(s)   ESC [= Ps l
Unlock (enable) key(s)   ESC [= Ps h

     Ps   **Key**

     11   SET UP
     12   ESC
     13   CLEAR SPACE
     14   BREAK

Key(s) enabled Permits an operator full use of the four keys.

Key(s) disabled Prevents an operator from possibly disrupting
a program's functioning by pressing the key(s).

Editing Key Mode   SET UP

Enable local editing key mode   ESC k
Enable duplex editing key mode   ESC l

Duplex mode Codes from editing keys are transmitted just as
character key codes are. The communication mode determines
where the terminal sends these codes.

Local mode Editing keys change only the screen. They do not
send a code to the computer.

Editing key mode affects the keys listed in Table 3-1, except
those noted. They are also reprogrammable (see Chapter 9).

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

These commands define whether or not the keys click when they
are pressed.

Sounding the Bell

Sound the terminal's bell   CTRL G

Use this command in a program to sound the terminal's bell.

Selecting the Bell Column

Load the margin bell column	**CTRL W**

This command sets the margin bell column at the current cursor
location. The margin bell sounds when the cursor reaches the
margin bell column during data entry from the keyboard. The
column value is not saved in nonvolatile memory: After reset
or power off, the margin bell column returns to its default
value of 72 (in 80-column mode) or 124 (in 132-column mode).

Margin Bell Mode	**SET UP**
	DEFAULT = Off
Margin bell on	**ESC [= 4 h**
Margin bell off	**ESC [= 4 l**

Bell on Margin bell sounds when the cursor reaches the margin
bell column when data is entered from the keyboard.

Bell off Margin bell does not sound when the cursor reaches
the margin bell column.

SCREEN APPEARANCE

Screen display commands let you choose the appearance of the
screen. You can select the color (light or dark) of the
screen, the cursor style, the number of columns per line, and
the visual attributes (the appearance of characters on the
screen).

Screen Saver	**SET UP**
	DEFAULT Ps = 0
Select screen saver time	**ESC [8 ; Ps v**

Ps	Effect
0	No screen saver
1	Screen blanks after 10 minutes idle
2	Screen blanks after 20 minutes idle
3	Screen blanks after 30 minutes idle

If the terminal is idle (no data received from the keyboard or
computer) for 10, 20 or 30 minutes, the screen blanks and the
words **PRESS ANY KEY TO MAKE SCREEN APPEAR** appear in the bottom
information line.

Screen Visibility

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

These commands determine whether or not the screen can display data.

Screen Background   SET UP

DEFAULT = Dark

Light background with dark characters	ESC b
Dark background with light characters	ESC d

The screen's background is either light with dark characters or dark with light characters.

Remember that you can also change the background in the set up line. What the screen background command does depends on the background chosen there. If the terminal receives a command that is the same as the current background, no change occurs.

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 automatically write-protected characters, so they are protected when ever you enable protect mode.

Attributes affect all subsequent characters up to the place
where you change the attribute again or the end of the line or
page, whichever comes first (depending on the attribute mode
you have selected).

Whether or not the attribute occupies a character space
depends on your choice of attribute space mode (in set up or
with the ESC F Ps command below).

Default attribute values are normal video, character space,
page based.

To set a visual attribute, place the cursor where (if the
attribute does not occupy a space) or one position before (if
the attribute occupies a space) you want the attribute to
start, then enter the appropriate escape sequence.

NOTE! See Table 5-2 for an explanation of the effect of
950 and 955 programming modes on embedded visual attributes.

Changing how characters appear can dramatically change the
screen's appearance. Table 6-1 describes the effects of
visual attributes.

Table 6-1
Effects of Visual Attributes

Name	Effect
Normal video	Restores background of screen to value in set up line (either dark or light).
Reverse video	Changes screen's 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.

Attribute Space Mode   SET UP
                                                  DEFAULT = Space
Attributes occupy a character space   ESC F 0
Attributes do not occupy a character space   ESC F 1

Character space attributes Visual attributes occupy a
character space (are embedded). Entering a character in that
space destroys the attribute (unless protect mode is on, since
attributes are write-protected).

NOTE! See Table 5-2 for an explanation of the effect of
950 and 955 programming modes on embedded visual attributes.

No space attributes Visual attributes do not occupy a
character space (are not embedded). The first character you
enter, **where the attribute starts or any place else on the
page,** does not destroy the attribute. But **after you enter
that first character,** entering a character where the attribute
starts destroys the attribute. Since attributes are write
protected, you can avoid destroying them by turning on protect
mode when you want to re-enter a character where an attribute
starts.

Normal Intensity Mode   SET UP
                                                  DEFAULT = Full
Half intensity mode   ESC [= 5 h
Full intensity mode   ESC [= 5 l

Half intensity Normal visual attribute is half intensity.
Write protected characters entered subsequently appear in full
intensity.

Full intensity Normal visual attribute is full intensity.
Write protected characters appear in half intensity.

Attribute Base Mode   SET UP
                                                  DEFAULT = Page
Page base attribute mode   ESC [= 2 h
Line base attribute mode   ESC [= 2 l

Page base Visual attributes affect data from the place you
change them to the end of the page.

Line base Visual attributes affect data from the place you
change them to the end of the line.

Selecting the Status Line Attribute   SET UP
                                                 DEFAULT Ps = 1
Select the status line visual attribute(s)   ESC [3 ; Ps v

>   **Ps   Attribute(s)**
>
>   0   Normal
>   1   Reverse
>   2   Normal underline
>   3   Reverse underline

This command lets you control the appearance of the status
line, normally displayed on the screen's bottom line. See
Chapter 8 for more information about the status line.

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, change the set up line, or turn off the
terminal.

Columns per Line Mode   SET UP
                                                 DEFAULT = 80
Enable 132 columns per line   ESC [= 3 h
Enable 80 columns per line   ESC [= 3 l

132 columns Each display line contains 132 columns.

80 columns Each display line contains 80 columns. If you
change from 132 columns to 80 columns, data in columns 81
through 132 remains in memory. The cursor also remains in its
current position, even when that column is beyond the right
margin of the screen, and you can enter data in the
undisplayed columns.

Changing from one column mode to another does not clear the
screen.

CHARACTER SETS AND BLOCK GRAPHICS

The 955 has U.S. and U.K. ASCII, special graphics, and multinational characters. An optional EPROM supplies six foreign character sets.

Selecting a Character Set	**SET UP**
	DEFAULT Ps = 0
Select a character set	**ESC [9 ; Ps v**

    Ps   Character Set

    0   U.S. ASCII
    1   U.K. ASCII
    2   French
    3   German
    4   Spanish
    5   Finnish
    6   Norwegian
    7   Italian

Resident character sets are U.S. ASCII and U.K. The other sets are available when you install an optional character set EPROM. You can also order a set of keycaps for any character set. Appendix F shows all the character sets.

Special Graphics Mode

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

Graphics mode on The terminal converts alphanumeric characters to 32 special graphics characters. The first 16 are compatible with the 950 terminal graphics characters. Figure 6-1 shows the 32 characters and keys you press to produce them. (The first character is a space, which occupies a position but does not display a character.)

Graphics characters are automatically write protected. Protect mode and visual attribute and intensity commands affect them as they would any other write-protected character.

NOTE! The 32 special graphics characters are contained in the character generator at positions hex 80 to 9F. When you enable 8-bit data word mode you can send these characters from the computer with that code range; however, sending those codes from the host may cause software incompatibilities.

Graphics mode off Alphanumeric keys produce ASCII characters.

Figure 6-1
Special Graphics and Multinational Characters

Multinational Character Set

Select a character from the multinational   **CTRL U Ps**
set

    Ps = Any ASCII character from ! (hex 21) to ~ (7E).

You can display any one character from a 94-character set of
international and mathematical symbols. Figure 6-1 shows the
multinational character set and corresponding ASCII characters
as they appear on the screen. Appendix G shows the characters
with their corresponding ASCII characters and hex values.

NOTE! The multinational character set is contained in the
character generator at positions hex A1 to FE. When you
enable 8-bit data word mode (with the command in the following
section) you can send these characters from the computer with
that code range. (The characters at hex A0 and FF are
reserved for firmware control.)

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Data Word Mode	SET UP
	DEFAULT = 7 bits
Read 7-bit data words	ESC [= 1 1
Read 8-bit data words	ESC [= 1 h

7-bit words The terminal ignores (masks) the eighth data bit in each byte received from the computer.

8-bit words The terminal reads the eighth data bit in each byte received from the computer. See Figure 6-1 or Appendix G for the characters the terminal generates when it receives codes from hex A1 to FE. (Although the special graphics characters are contained in the terminal's character generator at positions 80 through 9F, generating them by sending those codes from the host may cause software incompatibilities.)

Block Graphics

Define block graphics area up to 80 columns wide	ESC H w h
Define block graphics area 81 to 132 columns wide	ESC H ~ w h

> w = An ASCII character from Appendix E representing the length in character positions of the horizontal line that starts at the cursor and extends to the right.
>
> To calculate w for a line longer than 80 character positions, subtract 80 from the length and find the corresponding ASCII character.

> h = An ASCII character from Appendix E representing the height in character positions of the vertical line that starts at the cursor and extends down.

The w and h values define the outside dimensions of the rectangle.

You can outline one or more areas with horizontal and vertical lines. Figure 6-2 shows how the screen might appear with three overlapping blocks.

NOTE! Block graphics are limited by the length of the page and the defined scrolling region. If the block extends beyond the limits of the display, only part of it is visible. Entering values greater than the page results in a block that ends at the right or bottom margin.

Figure 6-2
Display with Three Blocks of Graphics

To create a block graphics area:

1.   Position the cursor where you want the top left corner
     before entering the sequence.

     NOTE!   Executing this sequence does not move the cursor.

2.   Define the width and height of the area with

         ESC H w h

     or

         ESC H ~ w h

     where w defines the width in character positions and h is
     the height in lines, as described above.

Special graphics mode does not affect block graphics.

Optional Graphics Firmware

Enable optional graphics firmware   ESC m

This command works only if you have an optional graphics board
installed in your terminal.

7. EDITING

Editing commands affect cursor movement and your ability to change data on the screen.

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.

Autowrap Mode	**SET UP**
	DEFAULT = On
Autowrap mode on	**ESC [= 7 h**
Autowrap mode off	**ESC [= 7 l**

Autowrap on The cursor wraps to the start of the next line if you enter a character when the cursor is on the current line's last position. Protect and autopage modes affect cursor movement in autowrap mode; see the sections about those modes for information on their effect.

Autowrap off Each character entered after the cursor reaches the line's last unprotected position replaces the previous one.

Autowrap mode does not change the effect of the cursor movement keys and commands.

|	
New Line Mode	**SET UP**
	DEFAULT = Off
New line mode on	**ESC [= 6 h**
New line mode off	**ESC [= 6 l**

New line on When the terminal receives a CTRL M (carriage return) code, either from the computer or from the RETURN key, the cursor moves down one line and then to the start of the line (LF/CR), as if it had received a CTRL _ (new line) code.

New line off Carriage return code causes only a carriage return.

NOTE! A line feed and then a carriage return command can cause different cursor movements from a carriage return and then a line feed command, depending on the setting of protect mode. A line feed command causes the cursor to enter a protected field; a carriage return does not. See Figure 7-1.

Figure 7-1
Effect of Line Feed and Carriage Return Commands
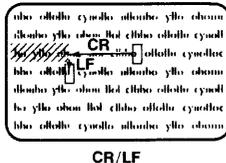
CR/LF

LF/CR

DOWN Key Mode	**SET UP**
	DEFAULT = CTRL V
DOWN key sends CTRL J	ESC [= 9 h
DOWN key sends CTRL V	ESC [= 9 l

CTRL J DOWN key sends a line feed (CTRL J) code. The key actually sends the code in the memory of the shifted DOWN key.

CTRL V DOWN key sends a cursor down (CTRL V) code.

See Chapter 9 for other commands to reprogram the DOWN key.

Write Protect and Protect Modes	
	DEFAULT = Off
Turn on write protect mode	ESC)
Turn off write protect mode	ESC (
Turn on protect mode	ESC &
Turn off protect mode	ESC '

After you enable write protect mode, data you enter becomes a **write-protected field.** It appears in half intensity unless you have changed the normal intensity attribute.

Graphics characters and visual attributes are automatically write protected, so when you enable protect mode, they are protected.

When protect mode is on, cursor movement commands cannot cause data to scroll off the page and be lost. Only the insert character(s) command can cause loss of unprotected data.

NOTE! You can destroy protected data when the terminal is in 950 programming compatibility mode by changing an embedded visual attribute when the cursor is in a protected field. The new visual attribute destroys the character at the cursor position. The cursor then moves to the first unprotected position following the protected field.

The cursor can be anywhere when you turn on protect mode.

Table 7-1 describes the effects of protect mode.

Table 7-1
Effects of Protect Mode

Function	Effect
Data entry	No data, even unprotected, can scroll off the page. The cursor skips over protected fields during data entry.
Cursor movement	Cursor movement commands cannot cause protected **or unprotected** data to scroll off the page. 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.
Editing	Enabling protect mode automatically enables line edit mode. When protect mode is on, the terminal ignores the command to enable page edit mode. Editing commands affect only unprotected data.
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.

Protect mode lets you

Protect designated areas from change

Control transmission of those areas

You can create forms with permanent (protected) headings and blank areas for an operator to fill in later. Figure 7-2 shows a typical form. Protecting the headings keeps them from being accidentally deleted or changed.

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 all that data.

Figure 7-2
Sample Protected Form with Spaces Left for Data Entry
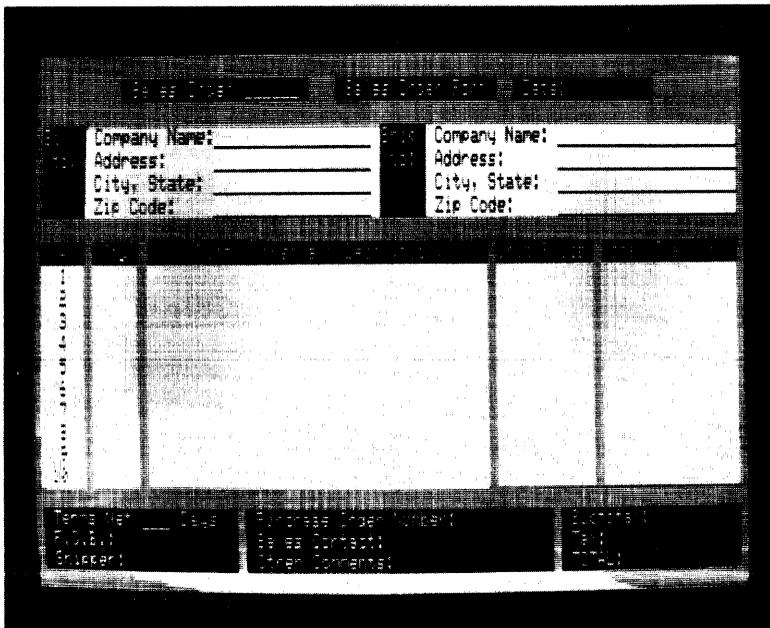
1.   Position the cursor where you want to enter the first
     protected character.

2.   Enter

         ESC)

     to activate write protect mode.

     NOTE! You must turn on write protect mode **before**
     entering data to be protected.

3.   Enter the information to be protected in that screen
     area. You can include visual attributes in the data.
     Whether the visual attribute occupies a position depends
     on whether you are using positioned or nonpositioned
     visual attributes.

4.   Proofread the entry and correct it if necessary.

5.   Enter

         ESC (

     to turn off write protect mode.

6.   Move the cursor to the next area to be write protected
     and repeat the first 5 steps.

7.   After you correctly enter all areas to be protected,
     protect the **whole form** from change by turning on protect
     mode.

ADDITIONAL SCREEN MEMORY

This section pertains only to terminals containing additional
pages of memory. You can order kits from the TeleVideo spare
parts department for one or three additional pages of memory.
The default value of each page of memory is 24 lines. The
commands in this section tell you how to configure the
terminal's memory for 48 or 96 lines per page.

The term **page** (i.e., document) refers to an amount of memory.
Not to be confused with page, **screen** refers to the face of the
tube on which data appears. The **display** is the amount of data
that can be viewed on the screen at one time--the viewable
region.

Since the screen displays 24 lines at a time, the display you
see on the screen may not contain the entire page. See Figure
7-3.

Figure 7-3
Partial Page of Memory Displayed on the Screen

Selecting the Number of Lines per Page

	DEFAULT = 24
Define number of lines on each page	ESC \ Ps

Ps is a value for the lines per page.

Ps	Lines per page	Number of Pages Four-Page Memory	Two-Page Memory
1	24	4	2
2	48	2	1
3	96	1	-

STOP! When you execute this command, the terminal:

    Clears all pages of memory
    Fills all pages with space characters
    Displays page one with the cursor on the home position
    Redefines the scrolling region as the entire 24 lines of
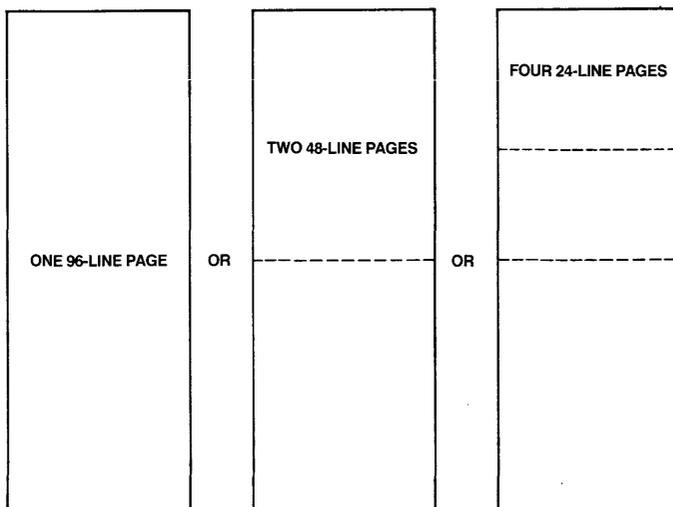   the display

If your terminal contains three extra pages of memory, you can
divide the terminal's total screen memory into one, two, or
four pages.

If it contains only one extra page of memory, you can
configure it as two 24-line pages or one 48-line page.

Without additional memory, the single page contains 24 lines.

Figure 7-4 shows the terminal's memory divided into pages.

Figure 7-4
Dividing Memory into Pages

```
+-----------------+     +-----------------+     +-----------------+
|                 |     |                 |     | FOUR 24-LINE PAGES |
|                 |     |                 |     |                 |
|                 |     | TWO 48-LINE PAGES |    +-----------------+
|                 |     |                 |     |                 |
| ONE 96-LINE PAGE |  OR |- - - - - - - -| OR  |- - - - - - - -|
|                 |     |                 |     |                 |
|                 |     |                 |     |                 |
|                 |     |                 |     |                 |
+-----------------+     +-----------------+     +-----------------+
```

Autopage Mode

	DEFAULT = Off
Autopage mode on	**ESC v**
Autopage mode off	**ESC w**

Autopage on A new page in the terminal's memory moves onto
the screen when the terminal receives a command to move the
cursor beyond the current page.

A line feed or reverse line feed command moves the cursor to
the first or last line of an adjoining page (while remaining
in the same column position.) See Figure 7-5.

A cursor right, cursor left, or cursor addressing command
displays the adjoining page when the cursor reaches the
beginning or end of a page. When the cursor reaches the end
of the last page, it returns to the beginning of the first
page.

Data on a page that moves off the screen is not cleared. When
you return to that page, your data reappears.

Autopage off Directional cursor movement commands cannot move
the cursor out of the current page or cause a new page to be
displayed. However, a cursor addressing command can display a
new page.

Figure 7-5
Cursor Movement in Autopage Mode

PAGE 1   PAGE 2
BEFORE   AFTER
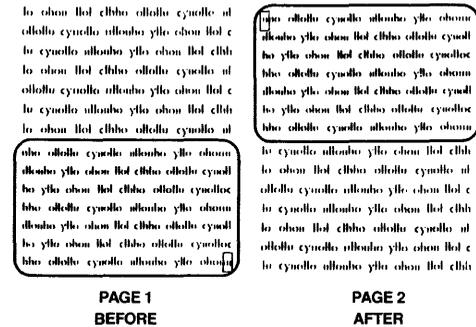
Moving to Another Page

Display the previous page	**ESC J**
	key SHIFT PAGE
Display the next page	**ESC K**
	key PAGE
Display page Pn	**ESC [1 ; Pn }**

Pn = A decimal value from 0 through 3

NOTE! The terminal can contain up to four pages of memory. The page **numbers**, however, are 0 through 3.

If you have already displayed the next or previous page, the cursor returns to its last location there after a next or previous page command. Otherwise, the cursor goes to the first unprotected (home) position. See Figure 7-6.

The command to display page Pn lets you move to any page in memory regardless of the page now displayed. The status of autopage mode is irrelevant.

Figure 7-6
Cursor Movement Between Adjacent Pages

PAGE 1   PAGE 2   PAGE 1

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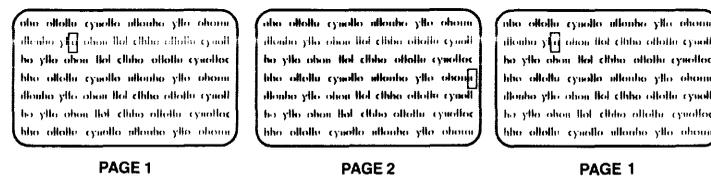
SCROLLING

Scrolling is the movement of the display (the screen area) through a page of memory on the screen. If your terminal has additional memory and your page size is greater than 24 lines, you can scroll the display up or down on the screen and view other parts of the **current page** with the all the cursor movement keys and commands and with the alphanumeric keys, i.e., by entering data.

NOTE! When protect mode is disabled, data entry from the computer or keyboard, as well as certain editing keys and commands, can cause the display to scroll into empty memory, resulting in a loss of data. Table 7-2 lists the keys and commands, and Figure 7-7 illustrates data loss from scrolling. To prevent loss of data, enable protect mode.

Table 7-2
Data Loss Due to Scrolling

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

	SET UP DEFAULT Ps = 0
Controlling the Rate of Scrolling	
Display scrolls smoothly at 4 lines per second	ESC 8
Display scrolls at the rate of received data	ESC 9
Select scroll rate	ESC [6 ; Ps v

Ps	Effect
0	Jump scroll
1	Display scrolls at 4 lines per second (normal)
2	Display scrolls at 2 lines per second (slow)
3	Display scrolls at 8 lines per second (fast)

The terminal's scrolling can be smooth or jump. Smooth scrolling moves the display at an even rate, regardless of how fast the terminal receives data. Jump scrolling displays data at the rate it is received.

NOTE! The terminal cannot control the scroll rate (smooth scroll) if you have not enabled a handshaking protocol (X-On/X-Off or DTR).

Defining a Scrolling Region

Define a scrolling region   ESC [Pt ; Pb r

>   Pt = **The (decimal) number of the first (top) line in the scrolling region**

>   Pb = **The (decimal) number of the last (bottom) line in the scrolling region**

To control the lines through which the display can scroll, turn autopage mode off and define a scrolling region. This fixes certain lines on the screen, while permitting the display to move through the rest of the page.

NOTE! You cannot change data outside the scrolling region. It remains fixed on the screen, although the display can move through data within the scrolling region. Remember that changing the number of lines per page redefines the scrolling region as the whole screen.

Figure 7-7 shows how data is lost when the display scrolls up through one page of memory.

Line Lock

	DEFAULT = Disabled
Enable line lock	ESC ! 1
Disable line lock	ESC ! 2

You can lock selected lines on the screen with this command so they remain fixed, regardless of whether the display scrolls through the remaining lines. However, no more than 23 of the 24 lines on the screen may be locked.

The cursor must be in the line you intend to lock.

Disabling line lock unlocks all the lines on the screen.

Figure 7-7
Scrolling Movement Within a Scrolling Region

NONSCROLLING REGION

DEFINED SCROLLING REGION

NONSCROLLING REGION

1. SCREEN WITH DEFINED SCROLLING REGION

2. SCREEN SCROLLS UP IN PAGE

3. SCREEN SCROLLS TO TOP OF PAGE

SPACE CHARACTERS

DATA LOST

4. DATA IS LOST AS SCREEN SCROLLS BEYOND TOP LINE

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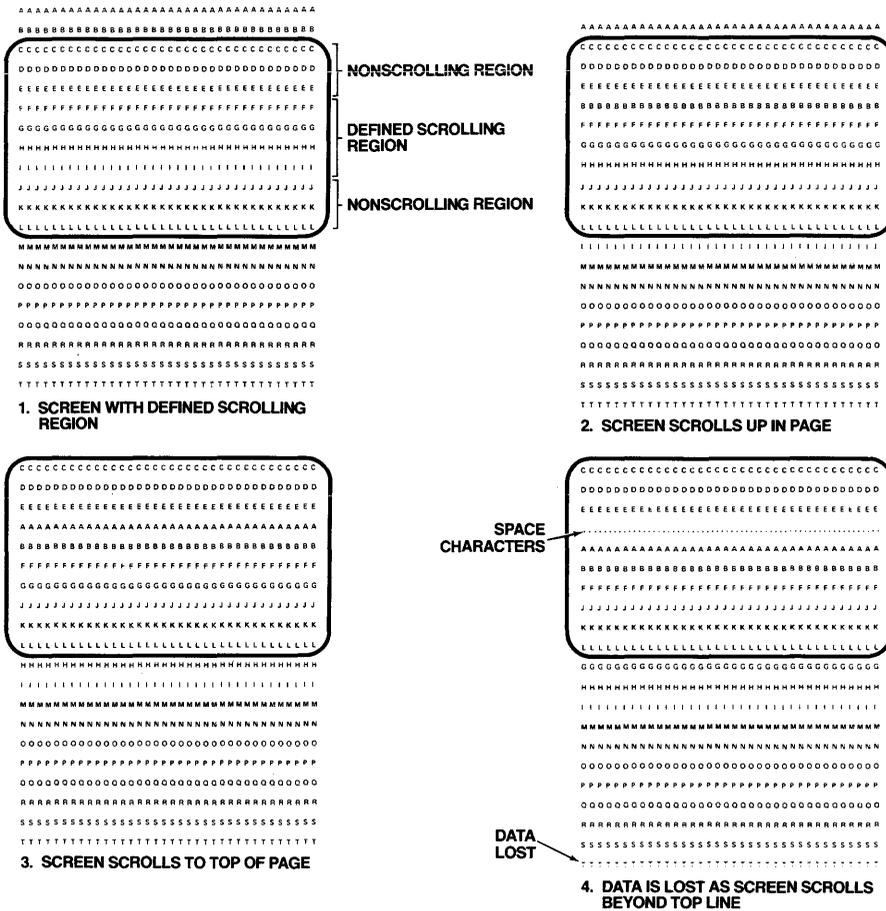
CURSOR CONTROL

You can control the movement of the cursor from the keyboard
and by programming commands. Many cursor movements are
affected by protect and autopage 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
                                                    key DOWN*

Reverse line feed   ESC j
                                                    key SHIFT UP

*Depends on DOWN key mode selection.

A line feed code moves the cursor down one line without moving
it sideways. A reverse line feed code moves it up. Autopage
and protect modes can affect where the cursor goes after the
terminal receives a line feed or reverse line feed code.
Tables 7-3 and 7-4 summarize these effects.

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

Table 7-3
Effect of Line Feed Code on Cursor Movement

Modes		
Auto- page*	Pro- tect	Effect
Off	On	The cursor moves down one line in the same column.
		If the cursor is at the bottom of the display and the page is configured for more than 24 lines, data rolls up one line.
		If the cursor is at the bottom of the page, it wraps around to the top line.

*If additional memory is installed.

Table 7-3 Continued
Effect of Line Feed Code on Cursor Movement

Modes		
Auto- page*	Pro- tect	Effect
Off	Off	Same as protect mode on, except if the cursor is at the bottom of the page, the display scrolls up one line. The page's top line is lost, and a new bottom line of space characters appears.
On	On/ Off	The cursor moves down to the next line. When it reaches that page's last line, it advances to the first line on the next page.

*If additional memory is installed.

Table 7-4
Effect of Reverse Line Feed Code on Cursor Movement

Modes		
Auto- page*	Pro- tect	Effect
Off	On	The cursor moves up one line. When it reaches the page's top line, it does not move any farther.
	Off	When the cursor reaches the page's top line, data scrolls down. A new top line filled with space characters appears, and the old bottom line is lost.
On Off	On/	When the cursor reaches the first line of the page, it returns to the last line of the previous page.
		If the cursor is on the first line of the first page, it does not move.

*If additional memory is installed.

Directional Cursor Movement

Move the cursor up	**CTRL K**
	key **UP**
	ESC [Pn A
Move the cursor down	**CTRL V**
	key **DOWN***
	ESC [Pn B
Move the cursor right	**CTRL L**
	key **RIGHT**
	ESC [Pn C
	key **SHIFT RIGHT**
Move the cursor left	**CTRL H**
	key **LEFT**
	key **BACK SPACE**
	ESC [Pn D
	key **SHIFT LEFT**
New line (line feed/carriage return)	**CTRL _**
	key **SHIFT ENTER**
Carriage return*	**CTRL M**
	key **ENTER**
	key **RETURN**

Pn = A decimal value specifying the number of moves.

*Depends on DOWN key mode selection.

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

The cursor up and down commands do not move the cursor beyond the top or bottom of the page, and the ESC [Pn commands don not move the cursor beyond the beginning or end of the line. However, the cursor right and left control codes wrap the cursor around.

Table 7-5 summarizes the effect of the cursor movement commands.

Table 7-5
Effect of Cursor Movement Commands

Command	Modes Auto-page*	Pro-tect	Effect
Cursor up CTRL K ESC [Pn A	Off/ On	Off/ On	Moves the cursor up within the present column until it reaches the top of the page. Additional commands have no effect.
Cursor down CTRL V ESC [Pn B	Off/ On	Off/ On	Moves the cursor down within column. When it reaches the last line of the page, subsequent commands have no effect.
Cursor left CTRL H ESC [Pn D	Off/ On	Off/ On	Moves the cursor left to an unpro-tected position. Wraps the cursor from the line's first unprotected postion to the previous line's last unprotected position.
	Off	Off/ On	The cursor does not move beyond the page's first unprotected position.
	On	Off/ On	Wraps the cursor from a page's first unprotected position to the previous page's last unprotected position. The cursor does not move beyond the first page's first unprotected position.
Cursor right CTRL L ESC [Pn C	Off	Off	The cursor moves right to an unpro-tected position. A CTRL L command wraps the cursor from a line's last position to the next line's first position.
			If the cursor is on the last column of the page's last line, a CTRL L causes data to scroll up one line. The page's first line is lost, and a new bottom line of space characters appears.

Table 7-5 Continued
Effect of Cursor Movement Commands

Command	Modes Auto-page*	Pro-tect	Effect
Cursor right	Off	On	If the cursor is on a page's last unprotected position, CTRL L wraps it around to the same page's first unprotected position.
	On	Off/ On	If the cursor is on a page's last unprotected position, CTRL L advances it to the next page's first unprotected position. If it is on the on the last page, it advances to the first page's first unprotected position.
New line (CTRL _)	Off/ On	Off/ On	Same as line feed and then carriage return (CTRL J and CTRL M). Moves the cursor to the first unprotected position on the next line.
Car-riage return (CTRL M)	Off/ On	Off/ On	Moves the cursor to the current line's first unprotected position.**
	Off/ On	On	If the cursor is on the line's only unprotected position, it does not move.

 *If additional memory is installed.
**When line feed/carriage return has been selected, performs a
  line feed, then a carriage return.

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Addressing the Cursor

Address (send) cursor to page, row, and   ESC – p r c
columns 1 through 80

Address (send) cursor to page, row, and   ESC – p r ˜ c
columns 81 through 132

Address (send) cursor to row and columns   ESC = r c
1 through 80 in current page

Address (send) cursor to row and columns   ESC = r ˜ c
81 through 132 in current page

     p   Page

     0   One
     1   Two
     3   Three
     3   Four

     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.
        To calculate the value of c for columns 81–132,
        subtract 80 from the column number and find the
        corresponding ASCII character.

These commands, called **addressing** or **loading** the cursor, let
the computer move the cursor to a specific location within the
terminal's memory. When the cursor is in 80-column mode, you
can address the cursor to an undisplayed memory area in
columns 81 through 132 with this command and enter data there.

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 of the current page.

    ESC = (˜ Q

sends the cursor to row 9, column 130 of the current page.

Reading the Cursor

Read cursor's page, row, and column position	ESC /
Read cursor's row and column position	ESC ?

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

The terminal responds with ASCII characters representing page, row and column, followed by a CR character. The page number is reported as one of the following values:

Value	Page
0	One
1	Two
2	Three
3	Four

Row and column positions are values from Appendix E.

If the cursor location lies from column 81 to column 132, the report will include a ~ between the row and column values. To calculate the column value, add 80 to the column number from Appendix E.

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 of the current page, or

    (~ Q CR

to indicate a position of row 9, column 130.

Addressing the Cursor in Decimal Units

Address the cursor to line and column of   ESC [Pl ; Pc H
the current page in decimal units   or ESC [Pl ; Pc f

    Pl =   A decimal value with one or two digits for the row
           (line).

    Pc =   A decimal value with one, two or three digits for
           the column.

This command sends the cursor to a designated line and column
within the current page.

If the cursor address is in a nonexistent area, the command
moves the cursor to the current line's right or bottom margin.

If you enter no variables, the cursor moves to home position.

Cursor Home

Move cursor to home position   CTRL ^
                                  key HOME
                             or ESC [H
                                key SHIFT HOME

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

Reading the Cursor in Decimal Units

Read cursor's page, line, and column   ESC [? 6 n
position in decimal units
Read cursor's line and column position   ESC [6 n
in decimal units

The terminal responds in the format ESC [Pp ; Pl ; Pc R or
ESC [Pl ; Pl R. Page, line, and column are decimal units.

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 a Column of Tab Stops

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

*Main keypad only.

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. The cursor
moves from the new protected space character to the new field
tab stop. See Figure 7-8.

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 cursor's current column
position.**

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

Figure 7-8
Setting Field Tab Stops

NEW COLUMN OF
PROTECTED SPACE CHARACTERS

CURSOR MOVES TO
NEW FIELD TAB STOP

PROTECTED CHARACTERS
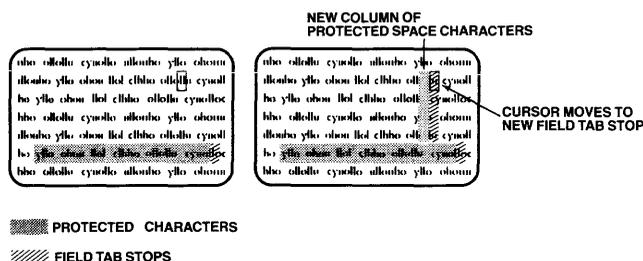
FIELD TAB STOPS

Moving the Cursor to a Tab Stop

Move cursor forward to next typewriter or   **CTRL I**
field tab stop   **key TAB**

Move cursor forward to next field tab stop   **ESC i**
(protect mode on)

Move cursor backward to previous typewriter   **ESC I**
or field tab stop   **key BACK TAB**

All tabulation commands are affected by protect mode. When
protect mode is off, CTRL I and ESC I move the cursor to a
typewriter tab stop; when it is on, they move it to a field
tab stop. And when protect mode is off, ESC i has no effect.
Table 7-6 describes how protect mode affects tabulation
commands.

Table 7-6
Effect of Protect Mode on Tabulation Commands

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 no more unprotected fields exist, the cursor returns to the first unprotected position on the same page or the next page (if additional memory is installed and autopage mode is on).

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Table 7-6 Continued
Effect of Protect Mode on Tabulation Commands

Command	Protect Mode	Effect
Tab backward (ESC I)	Off	Moves the cursor back to the previous typewriter tab stop. If the cursor is already on the line's first tab position or if no other tabs stops exist, the cursor moves to the first column of the line.
	On	Moves the cursor back to the first position in the current or previous unprotected field. If the page has no previous unprotected positions, the cursor does not move, or it returns to the last unprotected field on the previous page (if the terminal has additional memory and autopage mode is on).

Clearing Typewriter 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

Protect mode does not affect these commands. The cursor's position is irrelevant when you clear all tab stops.

Clearing Field Tab Stop(s)

Field tab stops are not cleared with a command. However, you can disable them by turning protect mode off. When you turn it on again, you restore the previous field tab stops.

EDITING DATA

You can edit data in five ways:

Write over existing text

Insert character(s) (singly or a line)

Delete a character or a line of existing text

Erase existing text (leaving replacement or null
characters in its place)

Clear data

The terminal must be in replace mode to write over existing
text.

Line and Page Edit

	DEFAULT = Line
Enable page edit mode	ESC N
Enable line edit mode	ESC O

Line edit mode When you insert or delete characters, existing
data on moves forward or backward only on the current line.
Data pushed beyond the end of the line is lost. The terminal
automatically enables line edit mode when you turn on protect
mode.

Page edit mode Existing data wraps around from line to line.
Data moves to the end of the page before it is lost. When
protect mode is on, the terminal ignores the command to enable
page edit mode.

Insert and Replace Mode

Enable insert mode	ESC q
	key SHIFT CHAR INSERT
Enable replace mode	ESC r
	key SHIFT CHAR DELETE

Insert mode Existing data is pushed aside (to the right) by
new data as you enter it. Data pushed to the end of the line
or page is lost (depending on whether the terminal is in line
or page edit mode).

Replace mode New data replaces (writes over) existing data as
you enter it.

The Replacement Character

Load a replacement character

DEFAULT Ps = Space
ESC e Ps

    Ps = Any ASCII character.

Some editing commands replace data with a predefined
replacement character. You can reprogram this character as
any ASCII character. This command lets you replace data with
characters such as an underline or asterisk.

Inserting Data

Insert a replacement character at
the cursor position

ESC Q
key CHAR INSERT

Insert Pn replacement characters
starting at the cursor

ESC [Pn @

Insert a line of replacement characters
on the current line

ESC E
key LINE INSERT

Insert Pn lines of replacement characters
starting at the cursor line
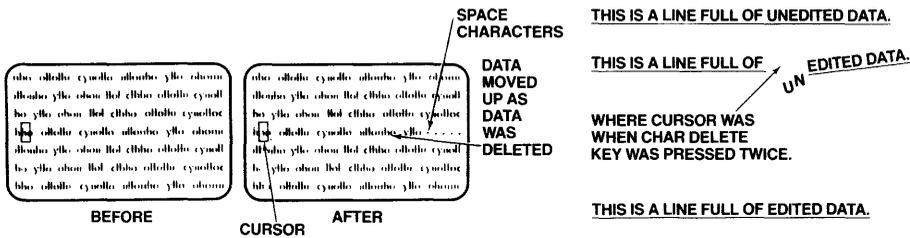
ESC [Pn L

    Pn = A decimal value

Table 7-7 describes how protect mode affects the action of
insert commands.

Table 7-7
Effect of Protect Mode on Insert Commands

Command	Protect Mode	Effect
Insert character (ESC Q) or characters (ESC [Pn @)	Off	Enters replacement character(s) at the cursor position and moves the existing characters right, starting at the cursor. Data pushed past the last line or page position 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) or lines (ESC [Pn L)	Off	Inserts line(s) of replacement characters starting at the current line; moves all following lines down. Cursor moves to column one of the first inserted line. Lines pushed off the page are lost.
	On	No action.

Deleting Data

Delete character at cursor position	ESC W key CHAR DELETE
Delete Pn characters starting at the cursor position	ESC [Pn P
Delete current line and replace with replacement characters	ESC R key LINE DELETE
Delete Pn lines, starting at cursor line, and replace with replacement characters	ESC [Pn M

Pn = A decimal value.

Deleting **removes** unprotected data only, starting at the cursor position, and pulls the remaining characters back to the cursor position. Replacement characters appear at the end of the line or the page.

Figure 7-9 shows what happens when you delete data in a line.

Figure 7-9
Deleting Data

THIS IS A LINE FULL OF UNEDITED DATA.

THIS IS A LINE FULL OF UN EDITED DATA.

WHERE CURSOR WAS
WHEN CHAR DELETE
KEY WAS PRESSED TWICE.

THIS IS A LINE FULL OF EDITED DATA.

Table 7-8 describes how protect mode affects the action
of delete commands.

Table 7-8
Effect of Protect Mode on Delete Commands

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

Erasing Data

Erase from the cursor to end of line; replace with replacement characters	ESC T key LINE ERASE
Erase in the current line; replace with with replacement characters	ESC [Ps K
Erase from the cursor to end of line; replace with null characters	ESC t key SHIFT LINE ERASE
Erase from the cursor to end of page; replace with replacement characters	ESC Y key PAGE ERASE
Erase in the page; replace with replacment characters	ESC [Ps J
Erase from the cursor to end of page; replace with null characters	ESC y key SHIFT PAGE ERASE

Ps	Amount Erased
0	From cursor to end of line/field or page
1	Start of line/field or home position to cursor
2	Entire (unprotected) line/field or page

Erasing **replaces** unprotected characters **only** with null or
replacement characters, as shown in Figure 7-10. 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.

Figure 7-10
Erasing Data

BEFORE   AFTER

CURSOR   SPACE
CHARACTERS
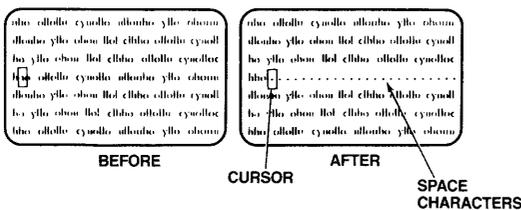
Clearing Data

Clear current unprotected field and   CTRL X
replace with replacement characters.   key CE
Return cursor to beginning of field
(protect mode on); or clear current tab
field or whole line and move cursor to
beginning of current tab field or line
(protect mode off)

Clear all characters and replace with   ESC *
null characters (reset protect and   key SHIFT CLEAR SPACE
write protect modes)

955 mode: Clear all characters and   ESC +
replace with replacement characters
(reset protect and write protect modes)
950 mode: Clear unprotected characters
and replace with replacement characters
(do not reset write protect and protect
modes)

955 mode: Clear unprotected characters   ESC ,
and replace with write protected space
characters (reset protect mode)
950 mode: Clear unprotected characters
and replace with write protected space
characters (do not reset protect mode)

Clear unprotected characters and replace   ESC ;
with replacement characters   or CTRL Z
                                         key CLEAR SPACE

Clear unprotected characters and replace   ESC :
with null characters

When you **clear** data, you replace data with space, null or
replacement characters. The cursor moves to the home position
(or, if protect mode is on, to the page's first unprotected
position). Unlike the previous editing commands, clearing
data does not depend on the cursor's position; what you clear
depends only on the command you give or the key you press.

Table 7-9 summarizes the actions of clear commands.

Table 7-9
Clear Commands

Command   **Effect**

Clear field   If protect mode is off and typewriter tab stops
to replace-   are set, clears all characters between the
ment charac-   typewriter tab stops before and after the
ters (CTRL X)   cursor to replacement characters. The cursor
                     moves to the beginning of that field.

                     If no typewriter tab stops exist, replaces the
                     current line with replacement characters and
                     returns the cursor to the beginning of the line.

                     If protect mode is on, clears the unprotected
                     cursor field. The cursor moves to the
                     beginning of that field.

Clear all   Changes all data to null characters. Moves the
to null   cursor to home position. Turns off protect and
characters   write protect modes, if on. (Initial cursor
(ESC *)   position is irrelevant.)

Clear all   Changes all data to replacement characters.
to replace-   Moves the cursor to home positon. Turns off
ment char-   protect and write protect modes, if on.
acters   (Initial cursor position is irrelevant.)
(955 compati-
bility ESC +)

Clear   955 compatibility: Changes unprotected data
unprotected   to write-protected space characters. Moves the
to write   cursor to home position. Turns off protect
protected   mode, if on. (Initial cursor position is)
space   irrelevant.)
characters
(ESC ,)   950 compatibility: Changes unprotected data to
                     write protected space characters. Moves the
                     cursor to home position. Does not reset
                     protect mode. (Initial cursor position is
                     irrelevant.)

Table 7-9 Continued
Clear Commands

Command	**Effect**
Clear all unprotected to replacement characters (ESC ; or CTRL Z or 950 compatibility ESC +)	Changes all unprotected data to replacement characters. Moves the cursor to the first unprotected position. (Cursor's initial position is irrelevant.) Does not reset protect mode.
Clear all unprotected to null characters (ESC :)	Changes all unprotected data to null characters. Moves the cursor to the first unprotected position. (Cursor's initial position is irrelevant.)

8. COMMUNICATIONS

This chapter tells you how to set the terminal's operating values so it can communicate with a computer and printer. It also explains how to send data from the screen and how to load and send special messages.

CHANGING PORT OPERATING VALUES   **SET UP**

Select main port operating values   ESC { p1 p2 p3 p4
Select printer port operating values   ESC } p1 p2 p3 p4

p1	Baud Rate	p1	Baud Rate
1	50	9	1800
2	75	:	2400
3	110	;	3600
4	135	<	4800
5	150	=	7200
6	300	>	9600
7	600	?	19200
8	1200	@	38400*

*Main port only.

p2	Stop Bits
0	1
1	2

p3	Parity
0	No
1	Odd (receive/transmit)
3	Even (receive/transmit)
5	Mark
7	Space

p4	Word Length
0	8 bits
1	7 bits

This command temporarily changes the operating values of
either of the terminal's RS-232C ports. Unless you save the
new values in nonvolatile memory (see Chapter 5), they are
lost when you turn off the power.

An an example, if you enter

    ESC { < 0 3 1

the computer port's values become

    Baud rate   4800
    Stop bits   One
    Parity   Even
    Word length   7 bits

SETTING UP COMMUNICATIONS WITH THE COMPUTER

Before the terminal can send and receive data, you must set
its handshaking protocol and data word and communication
modes.

Selecting a Handshaking Protocol	**SET UP**
	DEFAULT Ps = 1
Disable X-On/X-Off; enable DTR line	**CTRL N**
Enable X-On/X-Off; disable DTR line	**CTRL O**
Select the terminal's handshaking protocol	**ESC [1 ; Ps v**

    Ps   Protocol

    0   No protocol
    1   X-On/X-Off
    2   DTR
    3   Both protocols

Sometimes the computer sends data faster than the terminal or
its printer can receive it. Part of the data may be lost.
The terminal sends signals to the computer called **handshaking
protocols** to prevent this data loss. You can use X-On/X-Off
or Data Terminal Ready (DTR) as the handshaking protocol
between the terminal and the computer. (Or you can select
both.)

The terminal's 256-character receive buffer holds data received through the computer port. If you enable the X-On/X-Off handshaking protocol, the terminal transmits the ASCII X-Off control character to the computer (asking it to stop sending data) as soon as the buffer's fill limit (selected in set up or with a command in this section) is reached.

When only 16 characters remain in the receive buffer after the screen has been updated, the terminal sends the computer an X-On character (telling it to resume data transmission to the terminal). While X-On/X-Off is enabled, voltage on the DTR line remains high.

Disabling X-On/X-Off activates the DTR line. Voltage on the DTR line drops when the receive buffer (from the computer port) reaches its fill limit. When only 16 characters remain in the receive buffer, the terminal raises voltage on the DTR line, signaling the computer that it may resume sending data.

Receive Buffer Fill Limit   SET UP
                                                     DEFAULT Ps = 0
Select the receive buffer fill limit   ESC [2 ; Ps v

Ps	Fill Limit (Bytes)
0	16
1	32
2	64
3	128

This command selects the byte capacity remaining in the terminal's receive buffer when the terminal sends the X-Off code to the computer or lowers the voltage on the DTR line.

Transmission Control Mode   SET UP
                                                     DEFAULT = Off
Transmission control on   ESC [= 0 h
Transmission control off   ESC [= 0 l

Transmission control on The terminal accepts X-On/X-Off signals from the computer. If the terminal sends data faster than the computer can receive it, the computer sends X-Off to tell the terminal to stop sending data. When the computer's receive buffer empties the computer sends X-On.

Transmission control off The terminal ignores X-On/X-Off signals from the computer.

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Selecting the Transmit Delay Rate   SET UP
                                               DEFAULT = 0
Select the character transmit delay rate   ESC [0 ; Pn v

    Pn = 0 to 7 character delays per character transmitted

This command causes the terminal to insert delays in the
character transmit rate. The delays can range from zero to
seven character delays per character transmitted.

NOTE! This command does not change the baud rate.

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 the
set up menus or with programming commands.

The 955 has four communication modes:

    Block
    Local
    Half duplex (conversational)
    Full duplex (conversational)

Table 8-1 describes each communication mode, and Figure 8-1
shows how data flows in each mode.

Table 8-1
Communication Modes

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 in block mode.
Local	The terminal's main (computer) port is turned off. All commands and keyboard entries go only to the terminal's screen, and the terminal cannot receive any data from the computer.

Table 8-1   Continued
Communication Modes

Name	Effect
Half duplex	The terminal sends keyboard entries to the screen and to the computer at the same time. Although it is a conversational mode, it does not permit the terminal to 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.

Figure 8-1
Data Flow in Communication Modes
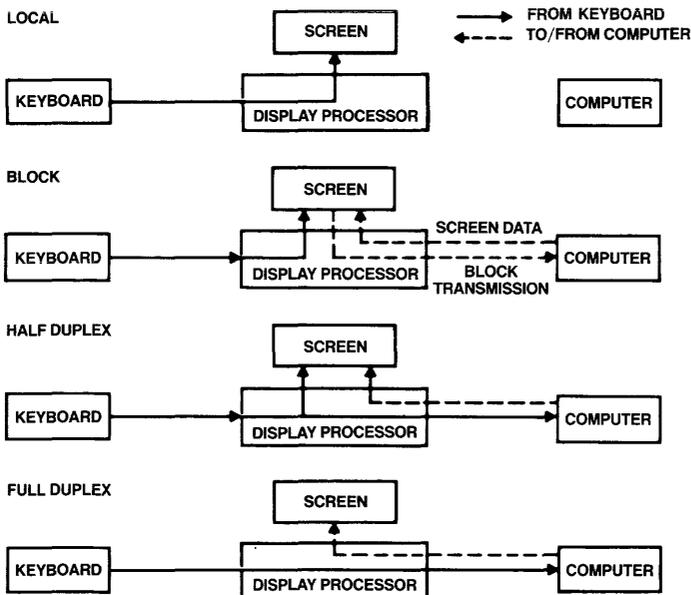
Setting the Communication Mode	SET UP
	DEFAULT = FDX
Block mode on	ESC B
Local mode on	ESC c
Half duplex mode on	ESC D H
Full duplex mode on	ESC D F
Return to previous conversational	ESC C
mode (half or full duplex) from	
block or local mode	

These commands let you move from one communication mode to another while you are running a program. The terminal returns to the communication mode selected in set up after you turn it off and back on or reset it.

SENDING SCREEN DATA

During full or half duplex mode, data entered on the keyboard goes to the computer immediately. But during block mode, sending it to the computer is a separate step. You can either press the shifted/unshifted SEND key or enter an escape sequence to send specific data.

You cannot send data to the computer in local mode.

Delimiters

Delimiters are data separators that tell the computer how much data the terminal has sent (a field, a line), or they can indicate the end of the transmission. Some transmission commands cause the terminal to automatically add delimiters for the beginning and end or in place of a field, the end of a line, or the end of the transmission. Unless you reprogram these delimiters, the terminal sends the control characters listed in Table 8-2.

NOTE! The terminal does not transmit nulls in the delimiter code to the computer.

Table 8-2
Default Delimiter Values

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**

0   Field separator
1   End of line
2   Start of protected field
3   End of protected field
4   Message terminator

p1 and p2 are ASCII characters

This command changes the delimiter characters stored in nonvolatile memory. It lets you define the line, field, and termination delimiters included when the terminal sends a 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.

Data Markers

You can define the amount of data affected by some of the send commands 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 Text

Send unprotected characters in cursor line   ESC 4
up to and including cursor

Send unprotected page up to and including   ESC 5
cursor

Send entire line of data up to and   ESC 6
including cursor   key SHIFT SEND

Send entire page up to and including   ESC 7
cursor   key SEND

Send unprotected message between start of   ESC S
text (STX)* and end of text (ETX)**

Send whole message between start of text   ESC s
(STX)* and end of text (ETX)**

 *If no STX character is present, text starts at home position.
**If no ETX character is present, sends through end of the page.

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 affect data
transmission.

Table 8-3 describes the effect of send commands. Turn back to
Table 8-2 for default delimiter values.

Table 8-3
Send Commands

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 page (ESC 5)	Sends unprotected data between and including the page's 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.*
Send entire page (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.*

*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.

Table 8-3 Continued
Send Commands

Command	Effect
Send unprotected message (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 page 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 page 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 page. Moves the cursor to the first unprotected position. If the page 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.

Table 8-3 Continued
Send Commands

Command	Effect
Send entire message (ESC s)	Sends all data between the STX character (if the cursor follows the STX character) or home (if the page lacks an STX character or the cursor is before the STX character) and the ETX character. Moves the cursor to the ETX character.

If page 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 page. Moves the cursor to the home or first unprotected position.

If page 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.*

*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

The 955 terminal can display two information lines. The first is at the top of your screen, above the 24 data display lines, and the other is at the bottom of the screen. Normally, the top line is blank and the bottom line displays the status line.

The 955 can store two separate user messages in memory, plus a small status line message. You can display either user message on either information line.

The commands in this section tell you how to load and display information line and identification messages and how to send them to the computer.

Sending the Terminal's Identification

Send terminal's identification   **ESC M**

When the terminal receives this command, it returns an
identification message to the computer. The message content
depends on the terminal compatibility mode:

Mode	Bytes	Message
955	10	955<space>R.0,m<CR>
950	6	R.0,m<CR>

R = Firmware revision level

0 = Firmware revision sublevel

m = Memory size in Kbytes:

    0   2 Kbytes
    1   4 Kbytes
    3   8 Kbytes

The Answerback Message   **SET UP**

Program the answerback message   **ESC ^ <text>**
                                                   CTRL Y
Send the answerback message   **CTRL E**

You can reprogram the terminal's answerback message. The text
can contain up to 16 ASCII control or display characters. To
include CTRL Y or CTRL P as a display character in the text,
rather than a command, precede it with CTRL P (which is not
counted as a character in the text). The terminal stores the
reprogrammed message in nonvolatile memory.

The default message is blank.

Displaying the Bottom Information Line's Contents

Display user message one on the screen's   **ESC g**
bottom line
Display the status line on the screen's   **ESC h**
bottom line

These commands let you choose the type of information
displayed on the screen's bottom line.

Selecting Both Information Lines' Contents   SET UP
                                              DEFAULT Ps = 0/1
Select the contents of the top   ESC [4 ; Ps v
information line
Select the contents of the bottom   ESC [5 ; Ps v
information line

    Ps   Type of Information

    0   Blank
    1   Status line
    2   User message one
    3   User message two

Loading the User Messages

Load text into user message one   ESC f <text>
                                             CTRL M
Load text into a user message   ESC _ p1 p2
                                             <text> CTRL M

    p1   User Message

    0   Message field in status line
    1   User message one
    2   User message two

    p2   Effect

    0   Clears the message before loading
    1   Writes over existing message

NOTE! The status line message is saved in the terminal's
nonvolatile memory. The user messages, however, are not.
When you turn off the power or reset the terminal, they are
lost.

You can enter 79 or 131 display characters and commands in the
user messages. Like the screen's other display lines, the
information lines contain 80 or 132 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 status line message contains seven characters.

If you want to change only part of the message, enter a value of 1 for p2, then move the cursor to the first character you want to change. To move the cursor within the message, enter the command CTRL I Pc or CTRL I ˜ Pc (for column positions 81-132), where Pc is a column position value from Appendix E.

Until you enter text in the user messages, they are blank (except for the visual attribute in the first character position).

The following example shows how to enter text into user message one on the bottom information line:

1. Display user message one on the bottom information line (if you want to see the message as you enter it) with

        ESC g

    or

        ESC [5 ; 2 v

2. Enter the command

        ESC f

    or

        ESC _ 1 0

    to clear the previous text and start loading new text into user message one.

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

4. Enter up to 79 or 131 characters of text. If you displayed the user message before entering text, you can see the message on the information line as you enter it. However, the cursor does not enter the line during the data entry.

5. You can also include visual attributes (described in the previous chapter) 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.

Sending the Information Line Contents

Send the information line contents   **ESC Z Ps**

    Ps   Information Line Contents

    0   User message one
    1   Status line
    2   User message two

You can send either user message or the status line to the
computer with this command.

THE FUNCT KEY

The FUNCT key transmits the ASCII code of the next
alphanumeric key pressed. That code is bracketed by the SOH
(start of header) and carriage return (CR) ASCII control
characters (shown in the ASCII Code Chart in Appendix C).

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 do not
need to worry about data being lost.)

PRINTING

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

For information about buffered printing, see the section on
printer handshaking protocols.

Print Commands		SET UP
		DEFAULT = Off
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
Page print		ESC [0 ; Ps i

Ps	Amount Printed
0	Formatted all
1	Formatted unprotected
4	Unformatted all
5	Unformatted unprotected

All print modes are mutually exclusive; you can only enable
one at a time. The terminal responds to a page print command
during any print mode (page print is a command, not a mode.)

Figure 8-2 shows the flow of data in print modes and Table 8-4
describes print modes and commands.

Figure 8-2
Print Modes

COPY

DATA DISPLAYED
ON SCREEN

COMPUTER

PRINTER

COMPUTER PORT   PRINTER PORT

TRANSPARENT

DATA NOT
DISPLAYED
ON SCREEN

COMPUTER

PRINTER

COMPUTER PORT   PRINTER PORT

BIDIRECTIONAL

COMPUTER

PRINTER

COMPUTER PORT   PRINTER PORT

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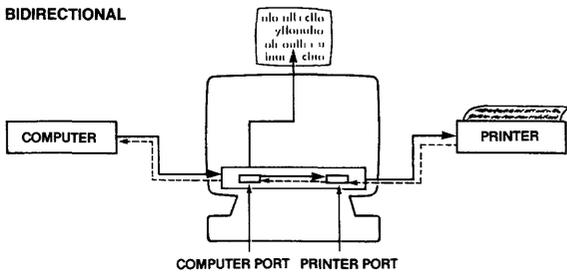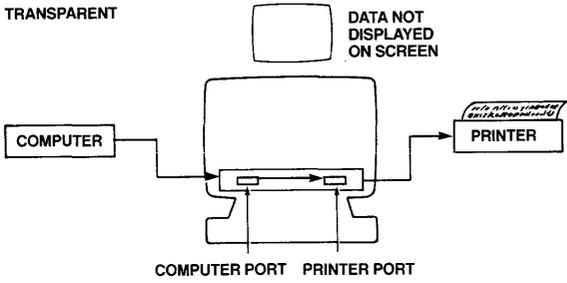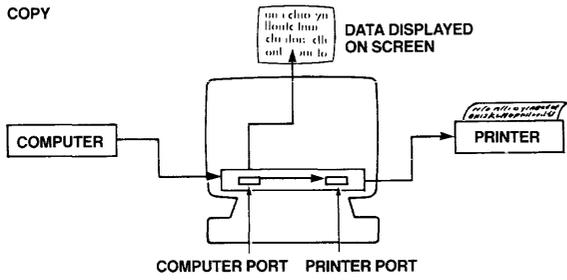
Table 8-4
Print Commands

Mode/Command   **Effect**

Buffered
copy print

All data from the computer or the keyboard goes to both the screen and the printer. Computer and printer baud rates can differ.

When the terminal receives the command to disable buffered copy mode, incoming data goes to the screen only. Data in the terminal's print buffer continues going to the printer until the print buffer is empty.

Buffered
transparent
print

Data from the computer or keyboard passes through the terminal to the printer without being displayed on the screen. During transparent print, you cannot edit the existing screen display. Computer and printer baud rates can differ.

When the terminal receives the command to disable buffered copy mode, data from the computer or keyboard again goes to the screen. Data in the terminal's print buffer continues going to the printer until the print buffer is empty.

Buffered
bidirectional
print

Data can pass both directions through the terminal. Data from the computer or keyboard also goes to the screen; data from the printer passes through the terminal to the computer but is not displayed on the screen. Computer and printer baud rates may differ.

When the terminal receives the command to disable bidirectional printing, the screen continues to display incoming data. The terminal no longer transmits data from the printer to the host, and printing stops after the terminal's print buffer empties.

Table 8-4
Print Commands Continued

Mode/Command   **Effect**

Page print   Prints the contents of the screen memory (page)
                 from the first character position through the
                 cursor position. Sends space characters in
                 place of graphics characters.

                 With one page of memory, screen updating (from
                 keyboard or computer) halts during
                 transmission. The terminal sends ACK to the
                 computer after transmission, and screen
                 updating resumes.

                 Whether or not the terminal displays the
                 next page of memory (if optional memory is
                 installed) during a page print depends on your
                 selection of flip or no flip mode in set up or
                 by a programming command. See the section on
                 page print flip mode following this table.

Formatted all (ESC [0 ; 0 i)	Sends all characters. Adds CR, LF, and null characters after each line.
Formatted unprotected (ESC P or ESC [0 ; 1 i)	Adds CR, LF and null characters after each line. Protected data is replaced by space characters.
Unformatted all (ESC L or ESC [0 ; 4 i)	Sends all characters. Does not add CR, LF, and null characters.
Unformatted unprotected (ESC [0 ; 5 i)	Same as above, but protected data is replaced by space characters.

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Page Print Flip Mode   SET UP
                                                 DEFAULT = On
Page print flip on   ESC [= 15 h
Page print flip off   ESC [= 15 l

Flip on   If additional pages of memory are installed in the
terminal, the display flips to the next page during page
print. The screen continues to accept data from the computer
or keyboard.

Flip off The current page of memory remains displayed, and
screen updating halts during transmission.

Printer Handshaking Protocols

The 955 responds to both X-On/X-Off and DTR handshaking
signals from a printer (or other device, such a modem)
connected to the terminal's printer port **except** under certain
conditions during bidirectional print mode. Table 8-5
describes how printer port handshaking protocols operate in
each print mode and the conditions that may cause the printer
to lose data.

NOTE! No protocol exists between the main and printer port
buffers. Data flows from the main port buffer into the printer
port buffer at the same rate as the flow of data from the
printer port buffer to the printer.

Table 8-5
Printer Port Handshaking Protocols

Mode/Command	Handshaking Protocol
Buffered copy	If the printer or other device sends X-Off or lowers its DTR line voltage, the terminal stops sending data. After both the printer port buffer and main port buffer fill, the terminal signals the host to stop sending data. Handshaking signals are exchanged between the host and the main port buffer only. Signals are not passed through the printer port or from the printer port buffer to the host. When the receive buffer empties, the terminal signals the computer to resume sending data.

Table 8-5   Continued
Printer Port Handshaking Protocols

Mode/Command   Handshaking Protocol

Buffered   If the printer or other device sends X-Off or
transparent   lowers its DTR line voltage, the terminal stops
                  sending data. When the printer port buffer
                  fills, the terminal sends X-Off to the
                  computer, no matter what the main port
                  handshaking protocol is. If the computer does
                  not respond to the X-Off from the printer port
                  buffer and the receive buffer fills, the
                  terminal then sends the main port handshaking
                  protocol signal the computer to stop sending
                  data (X-Off or DTR line low).

                  When the receive buffer empties, the terminal
                  signals the computer to resume sending data.
                  If the host ignores the receive buffer signal,
                  the terminal sends X-On when the printer port
                  buffer empties.

Buffered   If the terminal receives X-On/X-Off codes from
bidirectional   the device attached to the printer port, its
                  response depends on the protocol established
                  between the terminal and host:

                  If the host-terminal protocol is X-On/X-Off,
                  the terminal recognizes X-Off from the printer
                  as a handshaking signal, rather than passing it
                  through to the host as data, and stops sending
                  data to the printer until the printer sends X-
                  On. When the printer and main port buffers
                  fill, the terminal then signals the host to
                  stop sending data.

                  If the host-terminal protocol is not X-On/X-
                  Off, the terminal passes X-On/X-Off signals
                  from the printer to the host as data. If the
                  host does not respond to X-Off from the printer
                  by stopping the flow of data, **the printer may
                  lose data.**

                  If the printer lowers the DTR line voltage, the
                  terminal always stops sending data, regardless
                  of the host-terminal protocol. When the
                  printer and main port buffers fill, the
                  terminal signals the host to stop sending data.

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Table 8-5 Continued
Printer Port Handshaking Protocols

Mode/Command   **Handshaking Protocol**

Page print   When all data has been sent to the printer
port, the terminal sends the ASCII character
ACK to the computer, signalling the end of the
operation.

If the printer sends X-Off to the terminal or
lowers the DTR line voltage during page print,
the terminal stops sending data to the printer
until the printer sends X-On or raises the DTR
line voltage.

Page Print Terminator

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

    Ps = Any ASCII character

This 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.

9. REPROGRAMMABLE KEYS

This chapter gives the default codes of the editing keys and function keys and tells you how to reprogram them. When you change the contents of these keys, their new contents are saved in nonvolatile memory. The reset commands in Chapter 5 can return the keys to default values without changing other operating values.

FUNCTION KEYS

You can invoke a total of 64 function keys on the 955. The terminal has 16 keys and each key, shifted and unshifted, has two sets of memory. You can select the current function key set in set up or by a programming command. Tables 9-1 and 9-2 list the default sequences sent by each function key.

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 select a character transmit delay rate in set up or with a command, modify your software program, lower the baud rate to the computer, or change the handshaking protocol between the terminal and computer.

Table 9-1
Set One Default Function Key Codes

Unshifted Key	Code*	Shifted Key	Code*
F1	SOH @ CR	F17	SOH ` CR
F2	SOH A CR	F18	SOH a CR
F3	SOH B CR	F19	SOH b CR
F4	SOH C CR	F20	SOH c CR
F5	SOH D CR	F21	SOH d CR
F6	SOH E CR	F22	SOH e CR
F7	SOH F CR	F23	SOH f CR
F8	SOH G CR	F24	SOH g CR
F9	SOH H CR	F25	SOH h CR
F10	SOH I CR	F26	SOH i CR
F11	SOH J CR	F27	SOH j CR
F12	SOH K CR	F28	SOH k CR
F13	SOH L CR	F29	SOH l CR
F14	SOH M CR	F30	SOH m CR
F15	SOH N CR	F31	SOH n CR
F16	SOH O CR	F32	SOH o CR

Table 9-2
Set Two Default Function Key Codes

Unshifted Key	Code*	Shifted Key	Code*
F1	SOH P CR	F17	SOH p CR
F2	SOH Q CR	F18	SOH q CR
F3	SOH R CR	F19	SOH r CR
F4	SOH S CR	F20	SOH s CR
F5	SOH T CR	F21	SOH t CR
F6	SOH U CR	F22	SOH u CR
F7	SOH V CR	F23	SOH v CR
F8	SOH W CR	F24	SOH w CR
F9	SOH X CR	F25	SOH x CR
F10	SOH Y CR	F26	SOH y CR
F11	SOH Z CR	F27	SOH z CR
F12	SOH [CR	F28	SOH { CR
F13	SOH \ CR	F29	SOH ¦ CR
F14	SOH] CR	F30	SOH } CR
F15	SOH ^ CR	F31	SOH ~ CR
F16	SOH _ CR	F32	SOH ▒ CR

*Refer to the ASCII code chart in Appendix C.

Selecting the Function Key Set   SET UP
                                                      DEFAULT Ps = 0
Select function key set   ESC [7 ; Ps v

    Ps   Set

    0   One
    1   Two

This command determines the current function key set.

Reprogramming Function Keys   SET UP

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

Key	950-Compatible p1		955-Compatible p1	
	Unshifted	Shifted	Unshifted	Shifted
F1	1	<	1	A
F2	2	=	2	B
F3	3	>	3	C
F4	4	?	4	D
F5	5	@	5	E
F6	6	A	6	F
F7	7	B	7	G
F8	8	C	8	H
F9	9	D	9	I
F10	:	E	:	J
F11	;	F	;	K
F12	G	L	<	L
F13	H	M	=	M
F14	I	N	>	N
F15	J	O	?	O
F16	K	P	@	P

p1   **Both Modes**

<space>   Clear entire current function key set
              memory
0   Load function keys in sequence from F1

p2   **Message Destination**

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

The message can contain any combination of display and control characters. Precede CTRL Y, CTRL P, or CTRL \ by CTRL P to embed those characters in the message.

You can program up to 256 bytes into any one function key, but the each function key set's combined total cannot exceed 256.

When p1 = 0, bracket each key's message with the delimiters FS (hex 1C). Your command would look like this:

        ESC ¦ 0 p2 <message F1> FS p2 <message F2> FS p2 <message F3> FS p2 <message F4> FS ... p2 <message Fn) CTRL Y

NOTE! You can only load a total of 256 bytes. If you do not clear the keys before you start and your message exceeds the remaining number of unused bytes, the terminal destroys the existing messages, starting with shifted F16 and working backward, first through the shifted and then the unshifted keys (from highest to lowest p1 value). If you continue to load a message into a key after the existing messages in all keys with a higher p1 value have been destroyed, the message no longer loads into the function key memory. Instead, it is displayed on the screen.

If p1 = a space character (hex 20), you can omit the remaining command sequence (p2 <message> CTRL Y). You only need to enter

        ESC ¦ <space>

The value of p2 determines the destination of the message. If you send it to the screen, the computer cannot act on it. If you send it only to the computer, the message cannot appear on the screen, unless the computer echoes it back to the terminal. Think about where the message should go and enter the appropriate p2.

For example, let's program shifted function key F1 to tell the terminal to move the cursor to the end of the page, display the user line (which has been loaded with a message reminding the operator to turn on the printer), and print the contents of the page on a printer connected to the terminal. The message to the operator appears on the user line while the messages to the terminal are stored as escape sequences.

NOTE! This example assumes you are programming the function keys from the keyboard, so you are instructed to press LOC ESC to start the sequence. If you programmed the keys from the host, you would send the ESC control character.

1. Press

    LOC ESC ¦

    to start the programming sequence.

2. Press

    <

    to specify the shifted F1 key (950 compatible).

3. Press

    2

    to send the message to the terminal. Everything entered
    after this and before the terminating CTRL Y is
    considered part of the message.

4. Press

    ESC = 7 o

    where 7 and o are the values of the last row (line) and
    column position.

    When the terminal receives this sequence, it moves the
    cursor to the end of the page. This defines the amount
    to be printed.

5. Press

    ESC g

    to display user message one on the bottom line.

6. Press

    ESC P

    to start a page print.

7. Press

    CTRL Y

    to end the program contained by the shifted F1 key.

To calculate the bytes in this example, let's look at the
entire command. Remember, you only count the bytes in the
message portion of the command.

ESC ¦ < 2 ESC = 7 o ESC g ESC P CTRL Y

Now let's tally the bytes.

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

The message contains 8 bytes.

Now whenever the shifted F1 key is pressed, the terminal moves
the cursor to the end of the page, displays the user line, and
prints the contents of the screen.

Saving the Contents of the Function Keys SET UP
                                              DEFAULT = No save
Save function key reprogramming in   ESC [= 10 h
nonvolatile memory
Do not save function key reprogramming   ESC [= 10 l
in nonvolatile memory

Temporary keys Contents of the function keys are not saved in
permanent memory. Keys return to factory default values when
you reset the terminal or turn the power off.

Nonvolatile keys Reprogrammed contents of the function keys
are saved in permanent (nonvolatile) memory.

Invoking a Function Key

Invoke a function key   ESC [Pn ¦

Pn   **Function Key**

1-16   Unshifted 1-16
17-32   Shifted 1-16

This command calls from memory the contents of a function key
in the current set, as if you had pressed the key on the
keyboard.

REPROGRAMMING EDITING KEYS

You can reprogram the codes sent by the editing keys with the commands in this section.

The SEND Key

Reprogram the SEND key   ESC 0 Ps p1

    Ps   Key

    1   Unshifted
    2   Shifted

    p1   Code

    4   ESC 4
    5   ESC 5
    6   ESC 6
    7   ESC 7
    S   ESC S
    s   ESC s

This command lets you reprogram the unshifted and shifted SEND keys when the terminal is set for 950 compatibility. Turn back to Table 8-3 for an explanation of each code's effect.

One Editing Key

Reprogram any individual editing key   ESC 0 Ps p1 p2 p3

    Ps = An ASCII character from Tables 9-3 and 9-4
          representing the editing key

    p1, p2, and p3 are any three ASCII characters

This command lets you change the code the terminal sends from any one editing key when the terminal is set for 955 compatibility. Nulls can be included but are not transmitted.

NOTE! If you programmed the unshifted DOWN key to send CTRL J (in set up or by the programming command in Chapter 7), the unshifted key sends the code in the shifted DOWN key memory. So the unshifted DOWN key sends whatever code you reprogram into the shifted DOWN key.

Table 9-3
Default and Ps Values of Unshifted Editing Keys

Ps	Key	Function	Factory Default Values					
			Hex			ASCII		
@	HOME	Cursor home	1E	00	00	RS	NUL	NUL
A	DOWN	Cursor down	16	00	00	SYN	NUL	NUL
B	UP	Cursor up	0B	00	00	VT	NUL	NUL
C	LEFT	Cursor left	08	00	00	BS	NUL	NUL
D	RIGHT	Cursor right	0C	00	00	FF	NUL	NUL
E	TAB*	Tab cursor	09	00	00	HT	NUL	NUL
F	BACK TAB	Back tab	1B	49	00	ESC	I	NUL
G	CLEAR SPACE	Clear unprotected to spaces	1A	00	00	SUB	NUL	NUL
H	PRINT	Formatted unprotected	1B	50	00	ESC	P	NUL
I	CHAR INSERT	Insert character	1B	51	00	ESC	Q	NUL
J	CHAR DELETE	Delete character	1B	57	00	ESC	W.	NUL
K	LINE INSERT	Insert line	1B	45	00	ESC	Ë	NUL
L	LINE DELETE	Delete line	1B	52	00	ESC	R	NUL
M	LINE ERASE	Erase line with spaces	1B	54	00	ESC	T	NUL
N	PAGE ERASE	Erase page with spaces	1B	59	00	ESC	Y	NUL
O	PAGE	Next page	1B	4B	00	ESC	K	NUL
P	SEND	Send page	1B	37	00	ESC	7	NUL
Q	TAB**	Tab cursor	09	00	00	HT	NUL	NUL
R	CE	Clear entry	18	00	00	CAN	NUL	NUL
S	ENTER	Carriage return	0D	00	00	CR	NUL	NUL

 *On alphanumeric section of keyboard
**On accounting keypad

Table 9-4
Default and Ps Values of Shifted Editing Keys

Ps	Key	Function	Factory Default Values Hex		ASCII		
`	HOME	Cursor home	1B 5B 48	ESC	[	H	
a	DOWN	Line feed	0A 00 00	LF	NUL	NUL	
b	UP	Reverse line feed	1B 6A 00	ESC	j	NUL	
c	LEFT	Cursor left	1B 5B 44	ESC	[	D	
d	RIGHT	Cursor right	1B 5B 43	ESC	[	C	
e	TAB*	Set tab	1B 31 00	ESC	1	NUL	
f	BACK TAB	Clear tab	1B 32 00	ESC	2	NUL	
g	CLEAR SPACE	Clear all to nulls	1B 2A 00	ESC	*	NUL	
h	PRINT	Unformatted all	1B 4C 00	ESC	L	NUL	
i	CHAR INSERT	Insert mode	1B 71 00	ESC	q	NUL	
j	CHAR DELETE	Replace mode	1B 72 00	ESC	r	NUL	
k	LINE INSERT	Page edit mode	1B 4E 00	ESC	N	NUL	
l	LINE DELETE	Line edit mode	1B 4F 00	ESC	O	NUL	
m	LINE ERASE	Erase line with nulls	1B 74 00	ESC	t	NUL	
n	PAGE ERASE	Erase page with nulls	1B 79 00	ESC	y	NUL	
o	PAGE	Previous page	1B 4A 00	ESC	J	NUL	
p	SEND	Send line	1B 36 00	ESC	6	NUL	
q	TAB**	Tab cursor	09 00 00	HT	NUL	NUL	
r	CE	Clear tab stops	1B 33 00	ESC	3	NUL	
s	ENTER	Carriage return and line feed	0D 0A 00	CR	LF	NUL	

*On alphanumeric section of keyboard
**On accounting keypad

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All Editing Keys

Reprogram all editing keys   ESC] Ps
                                                         p1 ... p60

>   **Ps   Key**
>
>   0   Unshifted
>   1   Shifted
>
>   **pn = Three ASCII characters each for all editing keys**

This command lets you change the function of all the editing
keys in Tables 9-3 and 9-4 by changing the codes they send.
You must enter values for three ASCII characters for all 20
editing keys, in the order they are listed in the tables.

To reprogram both shifted and unshifted editing keys, send the
command twice with different Ps values.

Use this command when you want to reprogram most or all
editing keys; use the previous command when you want to change
only one key at a time.

To illustrate how this command functions, let's reverse the
effect of the shifted UP and DOWN keys. After the terminal
receives this command, the shifted DOWN key causes a reverse
line feed and the shifted UP key will cause a line feed.

1.   Press

     ESC] 1

     to start the programming sequence. Everything entered
     after this is considered part of the program.

2.   Enter, in a string without spaces, the following codes
     for shifted keys:

     RS NUL NUL   (This leaves the HOME key unchanged.)

     LF NUL NUL   (This changes the DOWN key's function.)

     ESC j NUL   (This changes the UP key's function.)

3.   Now continue entering three bytes of code apiece for the
     remaining editing keys.

APPENDICES

APPENDIX A SPECIFICATIONS

Part Number   132135-00

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- or 132-column lines; 25th and
                         26th information lines; 10 set up menus;
                         self test screen

Character Formation 7 x 9 dot matrix; 9 x 14 character cell

Character Sets   US ASCII and UK standard (96 upper- and
                         lowercase display with descenders, 32
                         control); 32 special graphics; 96
                         multinational

Visual Attributes   Space/no space; combinable; blink,
                         blank, underline, reverse field-based;
                         full/half intensity character-based;
                         block graphics

Cursor Attributes   Block (blinking or steady),
                         underline (blinking or steady), none

Cursor Control   Home, up, down, right, left (single and
                         mulitiple movement commands); carriage
                         return, line feed, reverse line feed,
                         new line; next page, previous page;
                         typewriter and field tabs (forward and
                         backward); address, read

Editing   Character/line insert/delete; line/
                         page/field erase; field/page clear;
                         smooth or normal scroll, definable
                         scrolling region, line lock; protect
                         mode; insert/replace and page/line edit
                         modes; programmable replacement
                         character

Reprogramming	64 function keys (two sets of 16 unshifted and shifted) and 20 editing keys, 950 or 955 compatible; answerback; status line message field; information lines; send and print delimiters
Communications Modes	Conversational (full or half duplex), block, local; monitor; local or duplex edit
Communications Interface	RS-232C 256-character buffered transmit/receive computer port; RS-232C 256-character buffered printer port; long-distance communcations option port; selectable character transmit delay rate
Communications Protocol	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	16 main port (50-38.4Kb) 15 printer port (50 to 19,200 Kb)
Print Capabilities	Formatted/unformatted page print; buffered copy or transparent print
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; selectable key disable
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

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   40 watts

Option board

    Dimensions   8.25 in. x 8 in.

    Available power   5V   1 amp
    (maximum)   +12V 100 mA
                       -12V 0 amp

Options   20 mA current loop
                          Neutral fuse
                          24 or 72 extra lines of screen memory
                          Amber screen
                          Long-distance communication interface
                          Internal modem
                          EPROM containing French, German,
                          Spanish, Finnish, Norwegian, and
                          Italian character sets
                          Foreign character set keycaps

APPENDIX B   STATEMENT OF LIMITED WARRANTY

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APPENDIX C ASCII CODE TABLES

Table C-1
ASCII Code Chart

BITS 4	3	2	1	Column → / ↓ Row	0 (000)	1 (001)	2 (010)	3 (011)	4 (100)	5 (101)	6 (110)	7 (111)
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)	= (75/61/3D)	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

**Table C-2
ASCII Control Character Abbreviations**

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   MONITOR MODE CONTROL CHARACTERS

Control Code	ASCII Character	Hex Value	Character Displayed
CTRL α	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	▓

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   FOREIGN CHARACTER SETS

Table F-1
Character Set Comparison

HEX CODE	23	40	5B	5C	5D	5E	60	7B	7C	7D	7E
US ASCII	#	@	[	\	]	^	`	{	¦	}	~
U.K.	£										
GERMAN		§	Ä	Ö	Ü			ä	ö	ü	β
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

NOTE! The French accent characters at positions 5E and 7E hex
and the Spanish accent character at position 6Ø hex create
composed characters. If the character following the accent is
an upper- or lowercase vowel, the terminal displays the accent
over the vowel. If any other character follows an accent, the
terminal ignores the accent and displays the character.

Figure F-1
U.S. ASCII Keyboard Layout
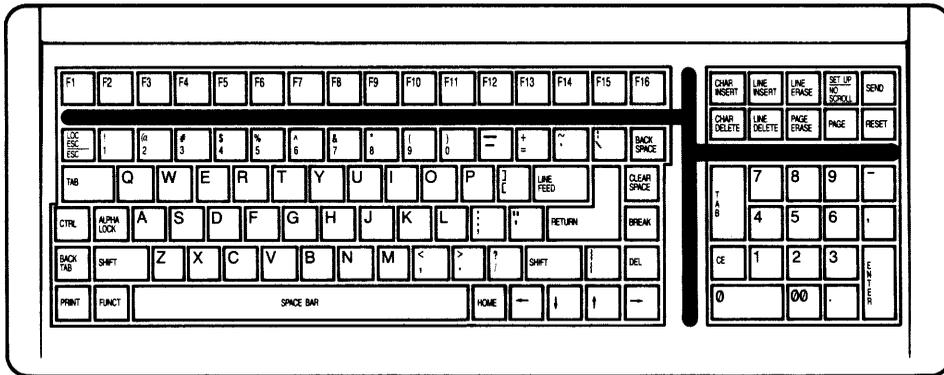
Figure F-2
U.K. Keyboard Layout
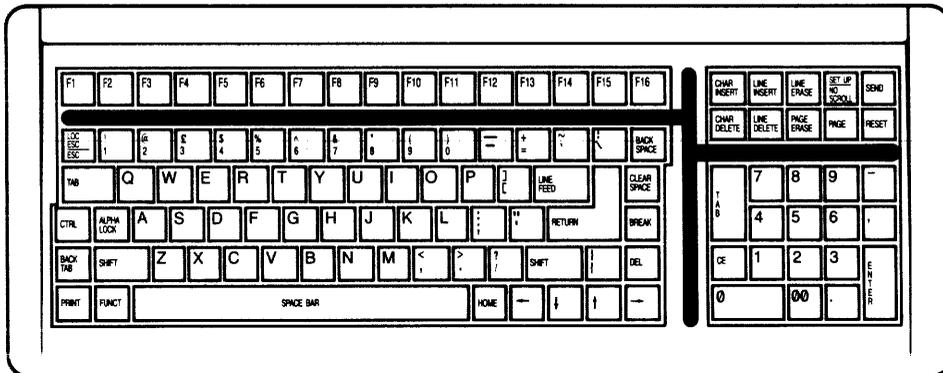
Figure F-3
German Keyboard Layout
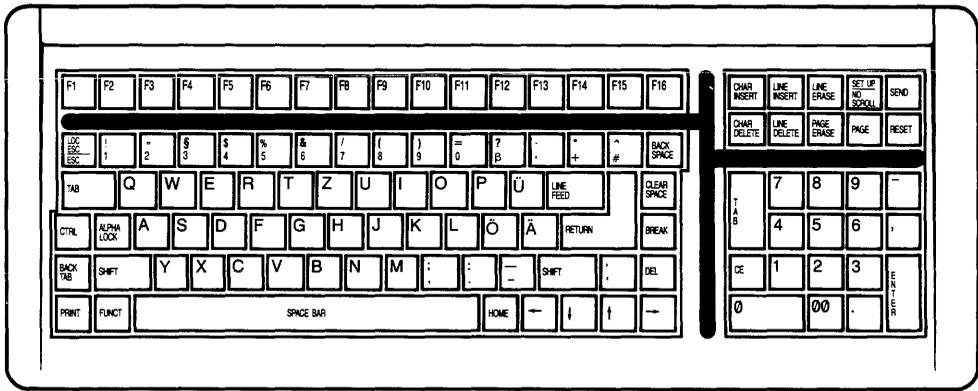
Figure F-4
French Keyboard Layout
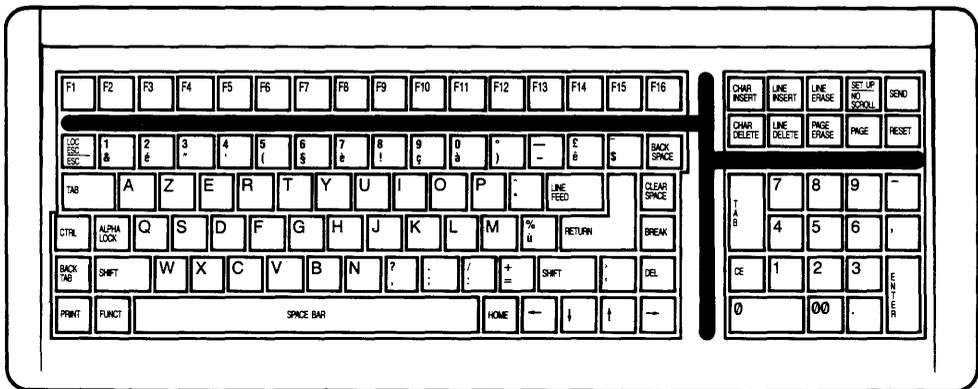
Figure F-5
Spanish Keyboard Layout
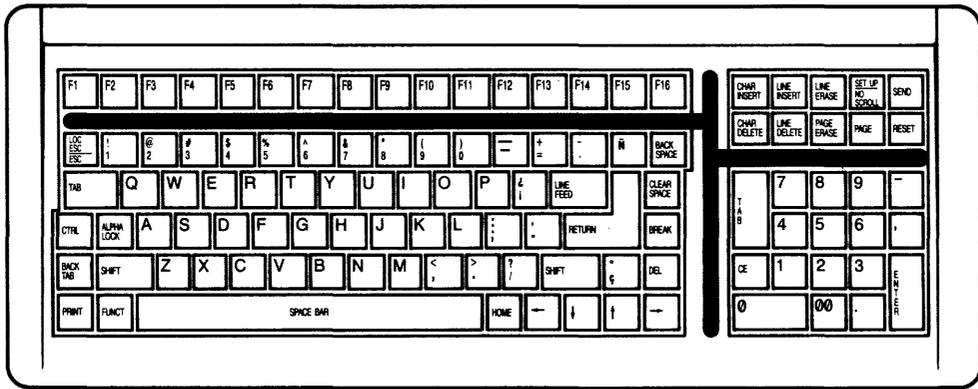
Figure F-6
Norwegian Keyboard Layout
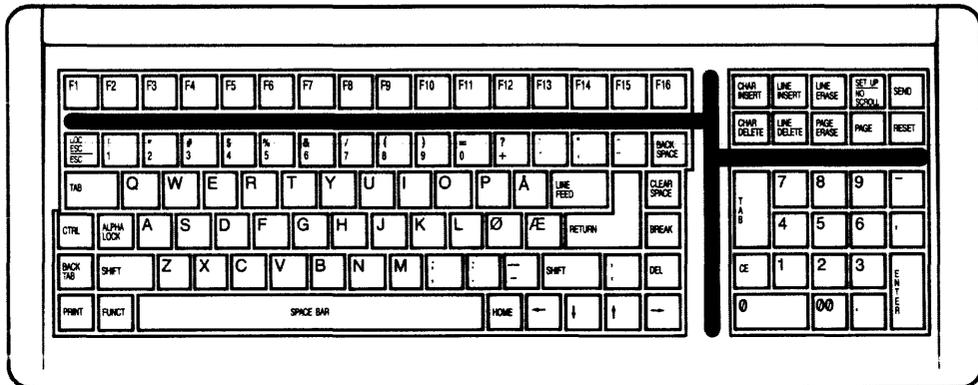
Figure F-7
Finnish Keyboard Layout
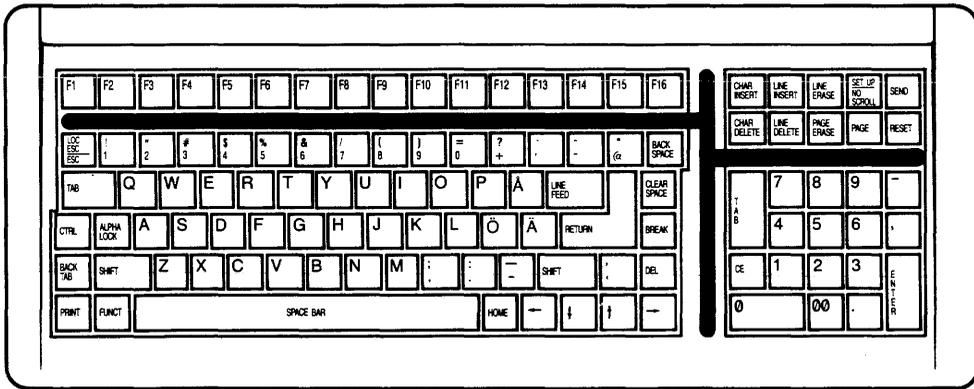
Figure F-8
Italian Keyboard Layout
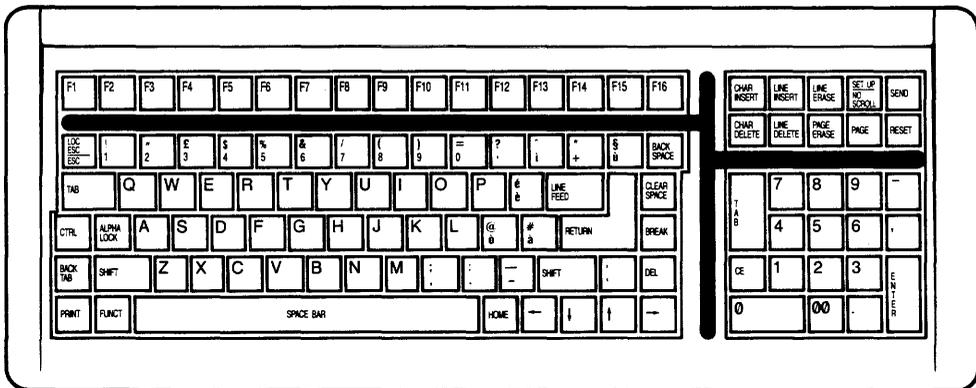
APPENDIX G   MULTINATIONAL CHARACTER SET

ASCII Character	Multi-national Character	Hex Value	ASCII Character	Multi-national Character	Hex Value
!	¡	21	K	Ë	4B
"	¢	22	L	Ì	4C
#	£	23	M	Í	4D
$	´	24	N	Î	4E
%	¥	25	O	Ï	4F
&	®	26	P	⌐	50
"	§	27	Q	Ñ	51
(	¤	28	R	Ò	52
)	©	29	S	Ó	53
*	ª	2A	T	Ô	54
+	θ	2B	U	Õ	55
'	π	2C	V	Ö	56
–	μ	2D	W	Œ	57
.	Ω	2E	X	Ø	58
/	Σ	2F	Y	Ù	59
0	₀	30	Z	Ú	5A
1	₁	31	[	Û	5B
2	₂	32	\	Ü	5C
3	₃	33	]	Ÿ	5D
4	ₙ	34	^	·	5E
5	₀	35		β	5F
6	₁	36	⌐	à	60
7	₂	37	a	á	61
8	₃	38	b	â	62
9	ₙ	39	c	ã	63
:	º	3A	d	ä	64
;	±	3B	e	å	65
<	≤	3C	f	æ	66
=	≠	3D	g	ç	67
>	≥	3E	h	è	68
?	¿	3F	i	é	69
@	À	40	j	ê	6A
A	Á	41	k	ë	6B
B	Â	42	l	ì	6C
C	Ã	43	m	í	6D
D	Ä	44	n	î	6E
E	Å	45	o	ï	6F
F	Æ	46	p	⌐	70
G	Ç	47	q	ñ	71
H	È	48	r	ò	72
I	É	49	s	ó	73
J	Ê	4A	t	ô	74

ASCII Character	Multi-national Character	Hex Value	ASCII Character	Multi-national Character	Hex Value
u	ō	75	z	ú	7A
v	ö	76	{	û	7B
w	œ	77	|	ü	7C
x	ø	78	}	ÿ	7D
y	ù	79	~	¨	7E

APPENDIX H   CONTROL CODES AND ESCAPE SEQUENCES

Table H-1
Control Codes

Command	Function	Key
CTRL E	Send the answerback message	
CTRL G	Sound the bell	
CTRL H	Move the cursor left	LEFT or BACK SPACE
CTRL I	Move cursor forward to next typewriter or field tab stop	TAB
CTRL J	Line feed	LINE FEED or SHIFT DOWN
CTRL K	Move the cursor up	UP
CTRL L	Move the cursor right	RIGHT
CTRL M	Carriage return	RETURN or ENTER
CTRL N	Disable X-On/X-Off; enable DTR line	
CTRL O	Enable X-On/X-Off; disable DTR line	
CTRL R	Buffered bidirectional print mode on	
CTRL T	Buffered bidirectional print mode off	
CTRL U	Select a character from the multinational character set	
CTRL V	Move the cursor down	DOWN
CTRL W	Load the margin bell column	
CTRL X	Clear current unprotected field and replace with replacement characters. Return cursor to beginning of field (protect mode on); or clear current tab field or whole line and move cursor to beginning of current tab field or line (protect mode off)	CE
CTRL [	Send ESC character to introduce escape sequence	ESC
CTRL Z	Clear unprotected characters and replace with replacement characters	CLEAR SPACE
CTRL ^	Move cursor to home position	HOME
CTRL _	New line (line feed/carriage return)	SHIFT ENTER

Table H-2
Escape Sequences

Command	Function	Key
ESC ! 1	Enable line lock	
ESC ! 2	Disable line lock	
ESC "	Unlock (enable) the keyboard	
ESC #	Lock (disable) the keyboard	
ESC $	Special graphics mode on	
ESC %	Special graphics mode off	
ESC &	Turn on protect mode	
ESC '	Turn off protect mode	
ESC (	Turn off write protect mode	
ESC)	Turn on write protect mode	
ESC *	Clear all characters and replace with null characters (reset protect and write protect modes)	SHIFT CLEAR SPACE
ESC +	955 mode: Clear all to replacement characters (reset protect and write protect modes) 950 mode: Clear unprotected to replacement characters	
ESC ,	955 mode: Clear unprotected to write protected space characters (reset protect mode) 950 mode: Clear unprotected to write protected space characters (do not reset protect mode)	
ESC - p r c	Address (send) cursor to page, row, and columns 1 through 80	
ESC - p r ~ c	Address (send) cursor to page, row, and columns 81 through 132	
ESC . Ps	Select cursor style	
ESC /	Read cursor's page, row, and column	
ESC 0 Ps p1	Reprogram the SEND key (950 mode)	
ESC 0 Ps p1 p2 p3	Reprogram any individual editing key (955 mode)	
ESC 1	Create column of tab stops at the current column	SHIFT TAB
ESC 2	Clear typewriter tab stop at cursor location	SHIFT BACK TAB
ESC 3	Clear all typewriter tab stops	SHIFT CE
ESC 4	Send unprotected characters in cursor line up to and including cursor	
ESC 5	Send unprotected page up to and including cursor	

Table H-2   Continued
Escape Sequences

Command	Function	Key
ESC 6	Send entire line of data up to and including cursor	SHIFT SEND
ESC 7	Send entire page up to and including cursor	SEND
ESC 8	Data scrolls smoothly at 4 lines per second	
ESC 9	Data scrolls at the rate received	
ESC :	Clear unprotected characters and replace with null characters	
ESC ;	Clear unprotected characters and replace with replacement characters	CLEAR SPACE
ESC <	Keyclick off	
ESC = r c	Address (send) cursor to row and columns 1 through 80 in current page	
ESC = r ~ c	Address (send) cursor to row and columns 81 through 132 in current page	
ESC >	Keyclick on	
ESC ?	Read cursor's row and column position	
ESC @	Buffered copy print mode on	
ESC A	Buffered copy print mode off	
ESC B	Block mode on	
ESC C	Return to previous conversational mode from block or local mode	
ESC D H	Half duplex mode on	
ESC D F	Full duplex mode on	
ESC E	Insert a line of replacement characters on the current line	LINE INSERT
ESC F 0	Attributes occupy a character space	
ESC F 1	Attributes do not occupy a space	
ESC G Ps	Define visual attribute(s)	
ESC H w h	Define block graphics area	
ESC I	Move cursor backward to previous typewriter or field tab stop	BACK TAB
ESC J	Display the previous page	SHIFT PAGE
ESC K	Display the next page	PAGE
ESC L	Print all unformatted page	SHIFT PRINT
ESC M	Send terminal's identification	
ESC N	Enable page edit mode	
ESC O	Enable line edit mode	
ESC P	Print unprotected formatted page	PRINT
ESC Q	Insert a replacement character at the cursor position	CHAR INSERT

Table H-2 Continued
Escape Sequences

Command	Function	Key
ESC R	Delete current line and replace with replacement characters	LINE DELETE
ESC S	Send unprotected message between start of text (STX) and end of text (ETX)	
ESC T	Erase from the cursor to end of line; replace with replacement characters	LINE ERASE
ESC U	Monitor mode on	
ESC V	Run the self test	
ESC W	Delete character at cursor position	CHAR DELETE
ESC X	Monitor mode off	
ESC Y	Erase from the cursor to end of page; replace with replacement characters	PAGE ERASE
ESC Z Ps	Send the information line contents	
ESC [	Command sequence introducer	
ESC \ Ps	Define number of lines on each page	
ESC] Ps	Reprogram all editing keys	
ESC ^	Program the answerback message	
<text> CTRL Y		
ESC _	Load text into a user message	
p1 p2 <text> CTRL M		
ESC `	Buffered transparent print mode on	
ESC a	Buffered transparent print mode off	
ESC b	Light background with dark characters	
ESC c	Local mode on	
ESC d	Dark background with light characters	
ESC e Ps	Load a replacement character	
ESC f	Load text into user message one	
<text> CTRL M		
ESC g	Display user message one on the screen's bottom line	
ESC h	Display the status line on the screen's bottom line	
ESC i	Move cursor forward to next field tab stop (protect mode on)	
ESC j	Reverse line feed	SHIFT UP
ESC k	Enable local editing key mode	
ESC l	Enable duplex editing key mode	
ESC m	Enable optional graphics firmware	
ESC n	Turn screen on	
ESC o	Turn screen off	
ESC p Ps	Define the page print terminator	

Table H-2   Continued
Escape Sequences

Command	Function	Key
ESC q	Enable insert mode	SHIFT CHAR INSERT
ESC r	Enable replace mode	SHIFT CHAR DELETE
ESC s	Send whole message between start of text (STX) and end of text (ETX)	
ESC t	Erase from the cursor to end of line; replace with null characters	SHIFT LINE ERASE
ESC u	Monitor mode off	
ESC v	Autopage mode on	
ESC w	Autopage mode off	
ESC x Ps p1 p2	Reprogram delimiter code	
ESC y	Erase from the cursor to end of page; replace with null characters	SHIFT PAGE ERASE
ESC z	Execute a program	
ESC { p1 p2 p3 p4	Select main port operating values	
ESC ¦ p1 p2 <message> CTRL Y	Reprogram a function key	
ESC } p1 p2 p3 p4	Select printer port operating values	
ESC ~ 0	Reset terminal to factory default values	
ESC ~ 1	Reset terminal to nonvolatile memory values	CTRL RESET
ESC ~ 2	Reset function keys to factory default values	
ESC ~ 3	Reset editing keys to factory default values	

Table H-3
ESC [Commands

Sequence	Function	Key
Pn @	Insert Pn replacement characters starting at the cursor	
Pn A	Move the cursor up	UP
Pn B	Move the cursor down	DOWN
Pn C	Move the cursor right	SHIFT RIGHT
Pn D	Move the cursor left	SHIFT LEFT
H	Address the cursor home	SHIFT HOME
Pl ; Pc H	Address the cursor to line and column of the current page in decimal units	
Ps J	Erase unprotected characters in the page; replace with replacement characters	
Ps K	Erase unprotected characters in the current line; replace with replacement characters	
Pn L	Insert Pn lines of replacement characters starting at the cursor line	
Pn M	Delete Pn lines, starting at cursor line, and replace with replacement characters	
Pn P	Delete Pn characters starting at the cursor position	
Pl ; Pc f	Address the cursor to line and column of the current page in decimal units	
0 ; Ps i	Page print	
6 n	Read cursor's line and column position in decimal units	
? 6 n	Read cursor's page, line, and column position in decimal units	
Pt ; Pb r	Define a scrolling region	
Pn ¦	Invoke a function key	
0 ; 1 }	Save current set up values in nonvolatile memory	
1 ; Pn }	Display page Pn	

Table H-4
Terminal Operating Modes

Command	State
ESC [= Ps h	Set terminal operating mode(s)
ESC [= Ps l	Reset terminal operating mode(s)

Ps	Mode	Set	Reset
0	Transmission control	On	Off
1	Data bits	8-bit	7-bit
2	Attribute base	Page	Line
3	Columns per line	132	80
4	Margin bell	On	Off
5	Normal intensity	Half	Full
6	New line mode	On	Off
7	Autowrap mode	On	Off
8	Keyboard repeat	On	Off
9	DOWN key	CTRL J	CTRL V
10	Function key	Save	No save
11	SET UP key	Enabled	Disabled
12	ESC key	Enabled	Disabled
13	CLEAR SPACE key	Enabled	Disabled
14	BREAK key	Enabled	Disabled
15	Page print flip	On	Off
16	Screen refresh rate	50 Hz	60 Hz

Table H-5
Variable Operating Values

Command	Function
ESC [p1 ; p2 v	Select a terminal operating value

p1	Function
0	Select character transmit delay rate
1	Select terminal's handshaking protocol
2	Select receive buffer fill limit
3	Select status line visual attribute(s)
4	Select top information line's contents
5	Select bottom information line's contents
6	Select scroll rate
7	Select function key set
8	Select screen saver time
9	Select a character set
10	Select reprogramming compatibility mode

APPENDIX I CALCULATOR MODE

This appendix describes the operation of 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: Answer:
          123456 + 123456 =   246912

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

Subtraction

To subtract 123456 from 246912:

Type: Answer:
          246912 - 123456 =   123456

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

Multiplication

To multiply 123456 by 2:

Type: Answer:
        123456 * 2 =   246912

Division

To divide 246912 by 2:

Type: Answer:
        246912 / 2 =   123456

If you divide by zero, the screen displays ERROR.

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

ACK An ASCII character (hex 06) meaning acknowledgement. Usually sent by the terminal to the computer to indicate page print or some local function is finished.

address Noun: A number identifying a unique location in the computer's 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**.

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's answerback can be unique. If 25 955 terminals are connected to the computer, the fifth 955 terminal could be programmed to reply, "955 5." Answerback codes are also used with modems.

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

ASCII Acronym: American Standard Code for Information 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 (found in Appendix C) are divided into 96 alphanumeric (display) and 32 control characters. See **alphanumeric characters, control characters**.

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

baud rate The number of binary bits transmitted per second.

bidirectional print A communication mode that enables two-way communication between devices attached to the computer and printer ports. Both devices must have the same baud rate, parity, word structure, and stop bits.

bit Acronym: binary digit. The simplest unit of data; always a one or a zero (meaning yes/no, on/off). 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.

break signal A signal sent by the BREAK key that holds the communication line (pin 2 of the main RS-232C connector) in the 0 state (low) for 250 milliseconds. It does not affect the terminal's 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.

buffer A temporary data storage location in the terminal's memory. Can be used to compensate for differences in transmission rates or temporarily store characters until the computer or printer can accept them. Buffers let data flow from the computer to the terminal at a different baud rate than from the terminal to the printer. See **handshaking protocol, DTR, X-On/X-Off**.

buffered print A print mode (either transparent or extension) that stores data in the terminal's buffer(s) when the computer sends data faster than the printer can receive it. See **transparent print, extension print, buffer**.

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

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

character keys The keys that send display (alphanumeric) characters to the terminal and/or computer.

connector The device (plug or jack) at the end of the cable and the electrical interface (port) of the computer, terminal, printer, etc. RS-232 connectors are commonly D-shaped and contain pins (male connector) or holes (female connector). The number of pins varies between equipment manufacturers. TeleVideo terminals have 25-pin female connectors.

control characters Characters that send a command to the terminal, rather than being displayed on the screen. The standard ASCII control characters are in the range of hex 00 to 1F. See the ASCII Control Chart in Appendix C.

conversational mode A communication mode that lets data flow interactively from one communication device to another. See **full duplex, half duplex.**

copy print See **extension print.**

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

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.

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-232, 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's 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.

CTS Acronym: Clear to Send. A signal on a dedicated RS-232 line indicating that the computer is ready to receive more data from the terminal.

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

DCD   Acronym: Data Carrier Detected. A signal on a dedicated RS-232 line that indicates whether or not the data carrier in the phone system is active and the device at the other end of the phone line is available.

DCE   Acronym: Data Communications Equipment. Usually the computer or the equipment connected to it.

default   A value or instruction in effect until otherwise defined.

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

delimiter   A code transmitted at the end of a predefined area (field) of data. Could be a field, end of line, or end of text delimiter.

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 TeleVideo's) displays the tail below the main line of text.

DIP Switches   Acronym: Dual In-Line Package. 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 appear on the terminal's screen, including alphanumeric and graphic symbols. See **characters, alphanumeric characters, graphics characters**.

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

DSR   Acronym: Data Set Ready. A signal on a dedicated RS-232 line indicating when the data coming from the computer is meant for your terminal (or another terminal on a network).

DTE   Acronym: Data Terminal Equipment. Equipment that supports data transmission from a terminal.

DTR Acronym: Data Terminal Ready. A 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) in the RS-232C connector. See **handshaking protocol, X-On/X-Off, buffer**.

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

EM Acronym: End of Message. An ASCII control character (hex 19) sometimes marking the end of a block transmission.

EPROM Acronym: Erasable, Programmable **ROM**. A read-only memory chip that can be erased and reprogrammed.

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

escape sequence A command introduced by an ASCII escape character (hex 1B) that controls terminal operations.

ETX Acronym: End of **Text**. An ASCII character (hex 03) that marks the end of a block transmission message.

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

field A group of characters affected in the same way by commands (e.g., a write-protected field).

firmware A program embedded on a chip, usually called an 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 (e.g., CR, LF, and null) 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.**

function keys Keys that send preset escape sequences whose
application is user definable. Many TeleVideo terminals have
reprogrammable function keys.

graphics characters Special non-ASCII characters used to draw
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.

handshaking protocol Prearranged signals the computer and the
peripherals send when they are ready to send or receive data.
They prevent data loss when the other device is not able to
accept or handle more data at that time. They can be ASCII
control characters (X-On/X-Off) in the data stream or they can
be raised or lowered voltage on RS-232C lines dedicated to
that purpose (DTR). See **DTR, X-On/X-Off, DCD, DSR.**

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. If the frequency rate of the terminal does not
match the frequency rate of the incoming alternating current, the
display may waver. Abbreviated Hz.

hexadecimal A numbering system with a base of 16 (digits 0-9
and A-F). Commonly used by programmers to indicate locations
and contents of a computer's memory. Abbreviated hex. See
the ASCII Code Chart in Appendix C.

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

information line Contrasting lines at the top and bottom of
the screen that do not display screen data. They can display
the status or set up lines, the user's message or nothing.
See **status line, set up menu.**

insert To add data within existing data, which is usually moved to the right at the point of insertion to make room for the new data.

interface An interaction or connection 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, interface.**

keyboard An arrangement of keys, similar to a typewriter's, on which an operator can enter data, send commands, and operate the terminal.

load To program information into memory.

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

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

menu A displayed list of operating values from which the operator can make selections.

message line See **information line.**

millisecond 1/1000 of a second.

mode An operating state that controls how the terminal operates or reacts to commands. 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. You can strike a series of keys virtually
simultaneously, and the characters will be transmitted in the
order in which the keys are pressed.

nonvolatile memory A permanent memory storage area not
affected by loss of power. This memory is backed up by a
lithium battery.

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

operating parameter A value (constant or selectable) 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).
See **mode**.

page The amount of available screen memory. Can range from
24 to 96 lines, depending on your terminal's configuration.
Since the screen displays 24 lines at a time, you may not see
the entire page. See **display, screen**.

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

parameter See **operating parameter**.

parity A method of checking received data bits to ensure they
are complete and accurate. If two devices are connected, the
parity setting for both devices must be the same. See **start
bit, stop bit**.

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

permanent memory See **nonvolatile memory**.

port The location at which data goes in and out of the device, usually the physical connector into which interface cables are plugged. See **connector, RS-232C, interface.**

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

protect mode A mode that protects specific data fields from any data entry or editing. Block mode transmission can exclude or include these areas.

RAM Acronym: Random-Access Memory. The changeable part of the computer or terminal's 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. See **ROM.**

read the cursor Report the cursor's position and content to the computer.

refresh To change or update the screen with new data.

replacement character The character that occupies the position previously occupied by an erased character. Unless you define it, it is a space character. See **delete, erase, space character.**

resolution The sharpness of the characters on the display. When a character contains a lot of small dots (pixels), it is much sharper than a character containing only a few large dots.

reverse video A terminal feature that produces the opposite combination of characters and background from the one usually employed (i.e., light characters on a dark background if normally characters are dark on a light background).

ROM Acronym: Read-Only Memory. A memory chip which, after manufacture, can be read but not written or altered. Used to store permanent instructions.

RS-232C A standard technical specification written 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). See **interface, current loop, RS-422.**

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

RTS Acronym: Request to Send. A line whose voltage changes to control data flow between computer, terminal, and printer. See **handshaking protocol.**

screen The terminal viewing area that shows 24 lines of data and two information lines. 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 (e.g., 10, 20, or 30 minutes), thus preventing the display pattern from being burned into the phosphor. To redisplay the screen, press any key. No data is lost.

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

scroll The action that moves the display (screen area) up or down in the page so you can see more than 24 lines on that page of memory. The direction, rate, and evenness of the scrolling can be controlled. See **page, display, screen.**

scrolling region The area in a page of memory through which the display can scroll. Movement of the cursor is limited to the scrolling region.

self-test A procedure that causes the terminal (or a program or peripheral) to check its own operation.

serial transmission A method of sending one bit of data at a time in a stream. See **RS-232C.**

set up A terminal mode that lets the operator change the terminal's operating values from the keyboard.

set up menu Lines displayed on the terminal's top and bottom
information lines during set up mode. Set up menus list all
terminal operating values that can be changed from the
keyboard. See **information line**.

software Various programs, including the operating system and
the applications programs, that can be loaded into the
terminal. See **firmware, program, system**.

SOH Acronym: Start of Header. An ASCII character (hex 01)
that frames the start of block of data to be transmitted. See
EM.

space character An ASCII alphanumeric character (hex 20) that
occupies a character position on the screen and in the
terminal's memory. Not the same as a null, which looks like a
space but contains nothing (i.e., is a void) and does not
occupy memory space. The terminal transmits space characters,
while it does not transmit null characters. See **null**.

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

status line A line appearing on the top or bottom information
line that describes the terminal's current operating
conditions.

start bit The bit that signals the beginning of data
transmission. It is always a one (1). See **parity, stop
bit**.

stop bit The bit that signals the end of data transmission.
It is always a one (1). The terminal can use either one or
two stop bits, depending on the computer's requirements. See
parity, start bit.

STX Acronym: Start of Text. An ASCII character (hex 02)
signalling that text transmission follows.

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

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 changed or deleted on command.

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

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

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

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 The aspects of a character's appearance on the screen. The character can be steady or blinking, full or half intensity, visible or blank (invisible), normal or reverse video, and underlined.

word structure The arrangement of bits in each piece of transmitted data. Consists of a start bit, the data bits, a parity bit (optional) and one or two stop bits.

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, DTR**.

QUICK REFERENCE GUIDE

VERIFYING OPERATIONS

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

CHANGING OPERATING VALUES

Set terminal operating mode(s)	ESC [= Ps h
Reset terminal operating mode(s)	ESC [= Ps l
Select a terminal operating value	ESC [p1 ; p2 v
Select 955 programming compatibility mode	ESC [10 ; 0 v
Select 950 programming compatibility mode	ESC [10 ; 1 v
Screen refresh rate is 60 Hz	ESC [= 16 l
Screen refresh rate is 50 Hz	ESC [= 16 h
Reset the terminal's operating values to factory default values	ESC ~ 0
Reset the terminal's operating values to nonvolatile memory values	ESC ~ 1
Reset function keys to factory default values	ESC ~ 2
Reset editing keys to factory default values	ESC ~ 3

RUNNING A PROGRAM

Execute a user-installed program	ESC z

KEYBOARD AND BELL

Lock (disable) the keyboard	ESC #
Unlock (enable) the keyboard	ESC "
Lock (disable) SET UP key	ESC [= 11 l
Unlock (enable) SET UP key	ESC [= 11 h
Lock (disable) ESC key	ESC [= 12 l
Unlock (enable) ESC key	ESC [= 12 h
Lock (disable) CLEAR SPACE key	ESC [= 13 l
Unlock (enable) CLEAR SPACE key	ESC [= 13 h
Lock (disable) BREAK key	ESC [= 14 l
Unlock (enable) BREAK key	ESC [= 14 h

KEYBOARD AND BELL

Enable local editing key mode	ESC k
Enable duplex editing key mode	ESC l
Keyboard repeat on	ESC [= 8 h
Keyboard repeat off	ESC [= 8 l
Keyclick on	ESC >
Keyclick off	ESC <
Load the margin bell column	CTRL W
Margin bell on	ESC [= 4 h
Margin bell off	ESC [= 4 l
Sound the terminal's bell	CTRL G

SCREEN APPEARANCE

Select screen saver time	ESC [8 ; Ps v
Turn screen on	ESC n
Turn screen off	ESC o
Light background with dark characters	ESC b
Dark background with light characters	ESC d
Define visual attribute(s)	ESC G Ps
Attributes occupy a character space	ESC F 0
Attributes do not occupy a character space	ESC F 1
Half intensity mode	ESC [= 5 h
Full intensity mode	ESC [= 5 l
Page base attribute mode	ESC [= 2 h
Line base attribute mode	ESC [= 2 l
Select the status line visual attribute(s)	ESC [3 ; Ps v
Select cursor style	ESC . Ps
Enable 132 columns per line	ESC [= 3 h
Enable 80 columns per line	ESC [= 3 l

CHARACTER SETS AND BLOCK GRAPHICS

Select a character set	ESC [9 ; Ps v
Special graphics mode on	ESC $
Special graphics mode off	ESC %
Select a character from the multinational set	CTRL U Ps
Read 7-bit data words	ESC [= 1 l
Read 8-bit data words	ESC [= 1 h
Define block graphics area	ESC H w h
Enable optional graphics firmware	ESC m

EDITING MODES

Autowrap mode on	ESC [= 7 h
Autowrap mode off	ESC [= 7 l
New line mode on	ESC [= 6 h
New line mode off	ESC [= 6 l
DOWN key sends CTRL J	ESC [= 9 h
DOWN key sends CTRL V	ESC [= 9 l
Turn on write protect mode	ESC)
Turn off write protect mode	ESC (
Turn on protect mode	ESC &
Turn off protect mode	ESC '

ADDITIONAL SCREEN MEMORY

Define number of lines on each page	ESC \ Ps
Autopage mode on	ESC v
Autopage mode off	ESC w
Display the previous page	ESC J
Display the next page	ESC K
Display page Pn	ESC [1 ; Pn }

SCROLLING

Data scrolls smoothly at 4 lines per second	ESC 8
Data scrolls at the rate received	ESC 9
Select scroll rate	ESC [6 ; Ps v
Define a scrolling region	ESC [Pt ; Pb r
Enable line lock	ESC ! 1
Disable line lock	ESC ! 2

TAB STOPS

Create column of tab stops at the current column	ESC 1
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
Clear typewriter tab stop at cursor location	ESC 2
Clear all typewriter tab stops	ESC 3

CURSOR CONTROL

Line feed	CTRL J
Reverse line feed	ESC j
Move the cursor up	CTRL K
	ESC [Pn A
Move the cursor down	CTRL V
	ESC [Pn B
Move the cursor right	CTRL L
	ESC [Pn C
Move the cursor left	CTRL H
	ESC [Pn D
New line (line feed/carriage return)	CTRL _
Carriage return	CTRL M̄
Address (send) cursor to page, row, and columns 1 through 80	ESC - p r c
Address (send) cursor to page, row, and columns 81 through 132	ESC - p r ~ c
Address (send) cursor to row and columns 1 through 80 in current page	ESC = r c
Address (send) cursor to row and columns 81 through 132 in current page	ESC = r ~ c
Read cursor's page, row, and column position	ESC /
Read cursor's row and column position	ESC ?
Address the cursor to line and column of the current page in decimal units	ESC [Pl ; Pc H
	or ESC [Pl ; Pc f
Move cursor to home position	CTRL ^
	or ESC [H
Read cursor's page, line, and column position in decimal units	ESC [? 6 n
Read cursor's line and column position in decimal units	ESC [6 n

EDITING DATA

Enable page edit mode	ESC N
Enable line edit mode	ESC O
Enable insert mode	ESC q
Enable replace mode	ESC r
Load a replacement character	ESC e Ps

Insert a replacement character at   ESC Q
the cursor position
Insert Pn replacement characters   ESC [Pn @
starting at the cursor
Insert a line of replacement characters   ESC E
on the current line
Insert Pn lines of replacement characters   ESC [Pn L
starting at the cursor line

Delete character at cursor position   ESC W

Delete Pn characters starting at the   ESC [Pn P
cursor position
Delete current line and replace with   ESC R
replacement characters
Delete Pn lines, starting at cursor   ESC [Pn M
line, and replace with replacement characters

Erase from the cursor to end of line;   ESC T
replace with replacement characters
Erase in the current line; replace with   ESC [Ps K
with replacement characters
Erase from the cursor to end of line;   ESC t
replace with null characters
Erase from the cursor to end of page;   ESC Y
replace with replacement characters
Erase in the page; replace with replace-   ESC [Ps J
ment characters
Erase from the cursor to end of page;   ESC y
replace with null characters

Clear current unprotected field and   CTRL X
replace with replacement characters.
Return cursor to beginning of field
(protect mode on); or clear current tab
field or whole line and move cursor to
beginning of current tab field or line
(protect mode off)

EDITING DATA

Clear all characters and replace with   ESC *
null characters (reset protect and
write protect modes)

955 mode: Clear all characters and   ESC +
replace with replacement characters
(reset protect and write protect modes)
950 mode: Clear unprotected characters
and replace with replacement characters
(do not reset write protect and protect
modes)

955 mode: Clear unprotected characters   ESC ,
and replace with write protected space
characters (reset protect mode)
950 mode: Clear unprotected characters
and replace with write protected space
characters (do not reset protect mode)

Clear unprotected characters and replace   ESC ;
with replacement characters   or CTRL Z
Clear unprotected characters and replace   ESC :
with null characters

CHANGING PORT OPERATING VALUES

Select main port operating values   ESC { p1 p2 p3 p4
Select printer port operating values   ESC } p1 p2 p3 p4

SETTING UP COMMUNICATIONS WITH THE COMPUTER

Disable X-On/X-Off; enable DTR line   CTRL N
Enable X-On/X-Off; disable DTR line   CTRL O
Select the terminal's handshaking protocol   ESC [1 ; Ps v
Select the receive buffer fill limit   ESC [2 ; Ps v
Transmission control on   ESC [= 0 h
Transmission control off   ESC [= 0 l
Select the character transmit delay rate   ESC [0 ; Pn v
Block mode on   ESC B
Local mode on   ESC c
Half duplex mode on   ESC D H
Full duplex mode on   ESC D F
Return to previous conversational mode   ESC C

SENDING SCREEN DATA

Reprogram delimiter characters	ESC x Ps p1 p2
Send unprotected characters in cursor line up to and including cursor	ESC 4
Send unprotected page up to and including cursor	ESC 5
Send entire line of data up to and including cursor	ESC 6
Send entire page up to and including cursor	ESC 7
Send unprotected message between start of text (STX) and end of text (ETX)	ESC S
Send whole message between start of text (STX) and end of text (ETX)	ESC s

LOADING AND SENDING MESSAGES

Send terminal's identification	ESC M
Program the answerback message	ESC ^ <text> CTRL Y
Send the answerback message	CTRL E
Display user message one on the screen's bottom line	ESC g
Display the status line on the screen's bottom line	ESC h
Select the contents of the top information line	ESC [4 ; Ps v
Select the contents of the bottom information line	ESC [5 ; Ps v
Load text into user message one	ESC f <text> CTRL M
Load text into a user message	ESC _ p1 p2 <text> CTRL M
Send the information line contents	ESC Z Ps

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
Page print	ESC [0 ; Ps i
Page print flip on	ESC [= 15 h
Page print flip off	ESC [= 15 l
Define the page print terminator	ESC p Ps

FUNCTION KEYS

Select function key set one	ESC [7 ; 0 v
Select function key set two	ESC [7 ; 1 v
Reprogram a function key	ESC ¦ p1 p2 <message> CTRL Y
Save function key reprogramming in nonvolatile memory	ESC [= 10 h
Do not save function key reprogramming in nonvolatile memory	ESC [= 10 l
Invoke a function key	ESC [Pn ¦

REPROGRAMMING EDITING KEYS

Reprogram the SEND key (950 mode)	ESC 0 Ps p1
Reprogram any individual editing key (955 mode)	ESC 0 Ps p1 p2 p3
Reprogram all editing keys	ESC] Ps p1 ... p60

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