AMPEX

Ampex Corporation • One of The Signal Companies

AMPEX 230 plus

Video Display Terminal

Operation Manual

P/N 3515844-01
March 1986

Computer Products Division
200 N. Nash St.
El Segundo, CA 90245
(213) 640-0150
Telex 664490
(800) 538-7838
In CA: (800) 231-1036

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF TABLES

FOREWORD

The *Ampex 230 plus* desktop video display terminal is an input/output peripheral capable of interfacing with a variety of computer systems and peripheral devices. The *Ampex 230 plus* terminal has its own set of operating characteristics ("native mode"), is fully compatible with the Ampex 230 terminal, and emulates the following terminals:

Manufacturer	Terminal Model
ADDS	Viewpoint A1, Viewpoint A2
Ampex Corp.	210
Hazeltine	1500
TeleVideo Systems, Inc.	910, 920/912, 924/914, 925, 950
Wyse Technology	WY-50

HOW TO USE THIS MANUAL

This manual contains the information necessary to operate the *Ampex 230 plus* Video Display Terminal.

The manual describes how the *Ampex 230 plus* terminal works in its native mode. Although it is likely that an action's effect (e.g., INSERT CHARACTER) is the same when emulating another terminal, differences are possible. Consult the manual for the terminal being emulated if the effect is not as expected. NOTE: The effect of an action available in an emulation but not in the native mode is not described in this manual.

Sections are summarized as follows:

FOREWORD Provides general information about the *Ampex 230 plus* video display terminal, including a physical description and overview of features.

SECTION I Explains how to physically install the terminal.

SECTION II Describes how to customize the terminal's settings for operation.

SECTION III Explains how to operate the terminal, including how to choose the proper communications mode, different ways of displaying data, how to enter and edit data, how to use function keys, sending and printing text, and how to re-program the programmable keys.

SECTION IV Describes how to choose an emulation and notable operational differences between the *Ampex 230 plus* native characteristics and the emulation's characteristics.

SECTION V Provides a brief troubleshooting guide.

APPENDICES Provide specifications, optional equipment installation (including national keyboard character sets), all escape and control sequences for both the *Ampex 230 plus* and emulations, codes for cursor addresses, ASCII characters, and monitor mode symbols.

Operating Modes

The terminal may be operated in a variety of "modes", which may be selected from the computer or via the keyboard. The available modes include:

Mode	Description
Block	Stores a block of data entered from the keyboard in the terminal display memory. Data may then be edited "on-screen" -- before being transmitted to the host.
Conversation	Transmits data to the host computer as it is entered from the keyboard on a character-by-character basis.
Local	Executes terminal functions locally -- transmission between the terminal and the host computer is prohibited.
Monitor	Control characters entered via the keyboard or received from the host are displayed on screen but not interpreted or executed.
Protect(Text)	Protects text entered in Write Protect mode from erasure, change, or transmission to computer or printer. Used, for example, in data entry on electronic forms.
Write Protect(ed Text)	Entered text is marked so that it will be protected when terminal is in Protect mode.

Page Memory

The terminal can store 96 lines of data in its own memory, divisible into units of one page (96 lines), two pages (48 lines per page), or four pages (24 lines per page).

Printing

A printer can be attached directly to the terminal via the terminal's "Printer" port. Printing may be controlled in a variety of ways :

Extension (Copy) Print	Prints data sent to the terminal by the host while displaying it on the screen.
Page Print	Printing initiated via the keyboard or from the host; prints the text from the Home position through cursor position; printing may be either formatted or unformatted.
Transparent Print	Printing completely controlled by the computer: printing cannot be initiated from the terminal; printed data is not displayed on the terminal screen.

Scrolling — A variety of scrolling options may be set, including:

- **Extended Page** — A 48-line or 96-line page may be scrolled without loss of data.
- **Flip** — Data exceeding the last line of a page may continue to scroll on the same page or "flip" to a new page.
- **Scroll Rate** — Data may be scrolled at any of four smooth rates or at a "jump scroll" rate.
- **Scroll Region** — Any block of adjacent rows may be defined as the scrolling region; or any set of individual rows or block of adjacent rows may be "locked" while data on the remaining lines scroll.

Set-up — Terminal operation is customized using menu-driven Set-Up lines, accessed via the SET-UP key. Lines display current values of terminal's operating parameters. Parameter values may be changed and saved.

Video Attributes — Video attributes can be assigned from either the terminal keyboard or the host computer. Video attributes may be either embedded (assigned to a field) or non-embedded (character-specific). Attributes can be assigned singly or in combination.

Blank (i.e., "invisible": characters not displayed)
Flash
Reverse
Underline
Half-Intensity (Dim)

1.1.1 AC Power Cord and Plug

The *Ampex 230 plus* terminal is equipped with either a 115 VAC/60 Hz power plug (for use in the United States) or a 230 VAC/50 Hz power plug (for use outside the United States). Make sure that the cord and plug are appropriate for the power output you intend to use (Figure 1-3).

NOTE: If you will be using the terminal in either the United Kingdom or Australia, you may need to customize the power plug in order to fit the receptacle.

WARNING

Before changing the plug, disconnect the cord from the wall outlet (AC power). Electric shock may result if the power cord is connected to AC power when the plug is cut from the cord.

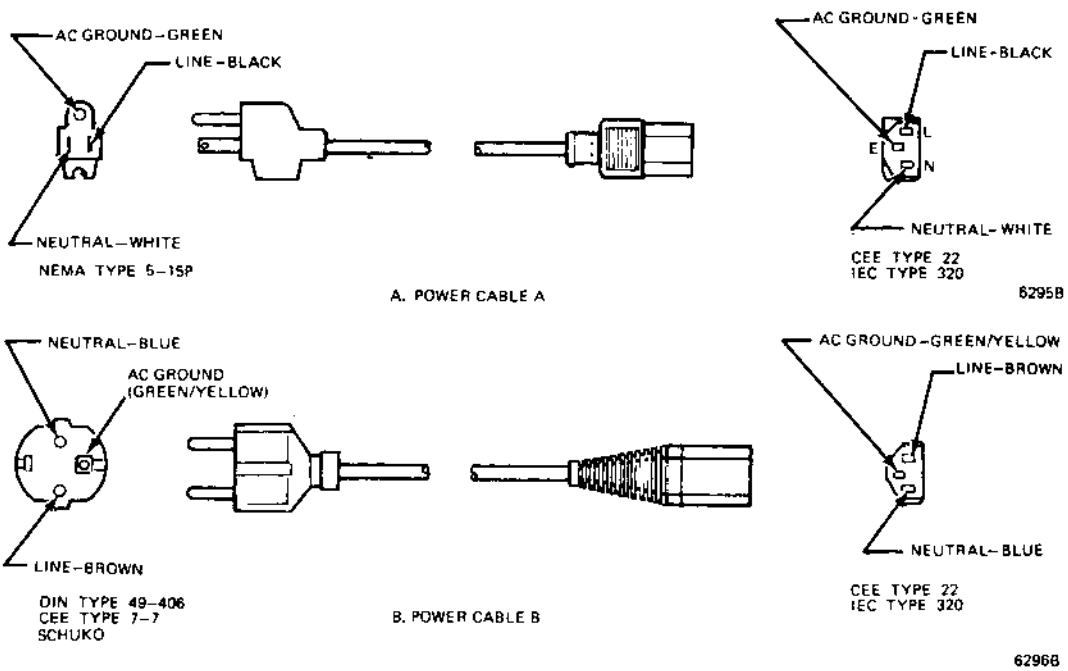


Figure 1-3. Power Cord/Plug Types

1.2 INSTALLING THE DISPLAY UNIT

The Display unit consists of a Cathode Ray Tube (CRT) mounted on a pedestal (Figure 1-2). The Display tilts and swivels for the most comfortable viewing angle.

The pedestal holds the ON/OFF switch for the terminal, two "ports" for attaching the unit to other equipment, and a "port" for connecting the keyboard to the display unit (see Figure 1-4).

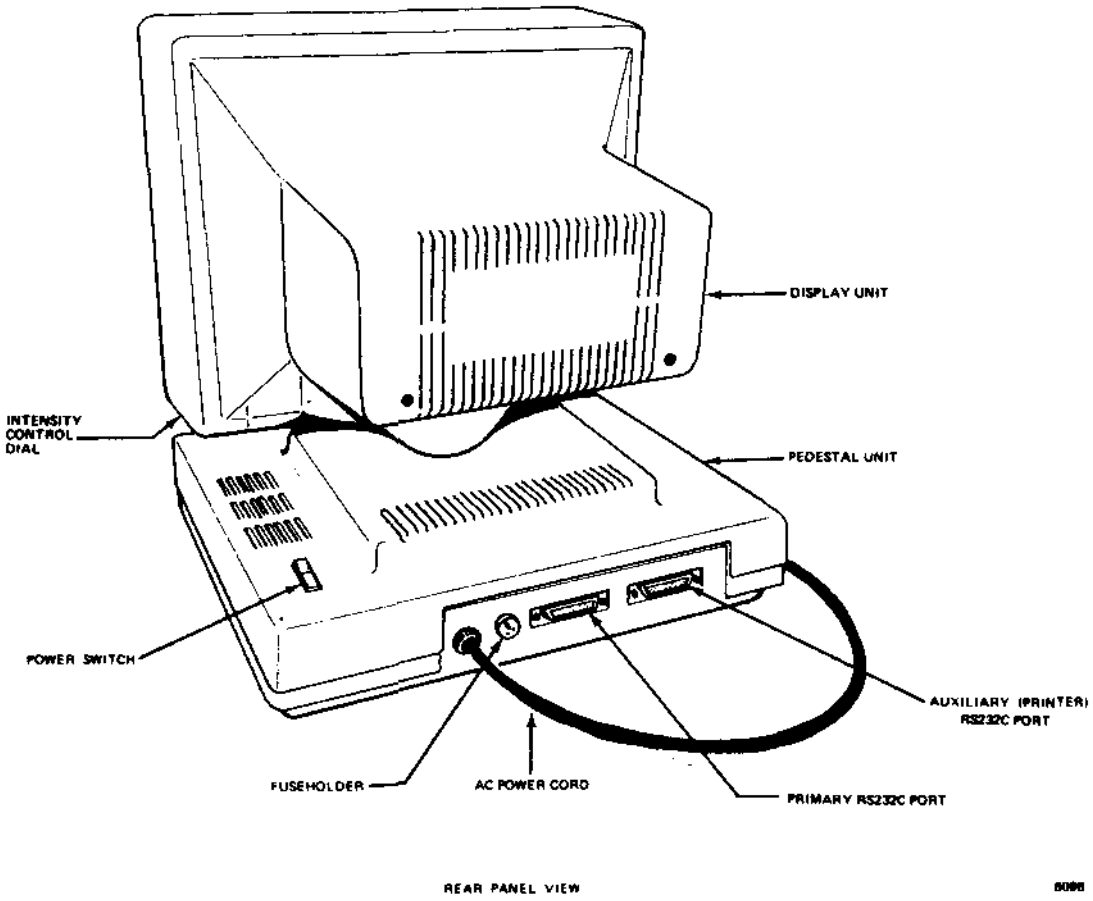


Figure 1-4. Terminal, Rear View

1.2.1 The Display Screen

The Display Screen is where characters you type or characters received from the host computer appear. Twenty-six rows may be displayed (Figure 1-5), divided as follows:

Row	Contents
Top	Status Line (reports terminal's status)
Middle 24 rows	Typed or received data
Bottom	User Line (for operator or application program entries)

Underneath the lower right side of the CRT is a brightness control(see Figure 1-4).

A CRT Saver built into the terminal turns off the display after about 10 minutes if no new characters are sent to the screen. Note: Ordinarily, Set-Up Line 1 flashes if the CRT Saver comes on. You can set the terminal so that the set-up line does not flash in this situation (Set-Up, Line 3: SAVER BLN).

NOTE

You can turn off the CRT Saver in Set-Up (Line 2: SAVE OFF). If you turn off the CRT Saver, be sure not to leave screen intensity at a high level for long periods of time. Doing so may wear the phosphor-coated screen unnecessarily.

This, and other options affecting the display screen, depend on choices you make when you SET-UP (Section II).

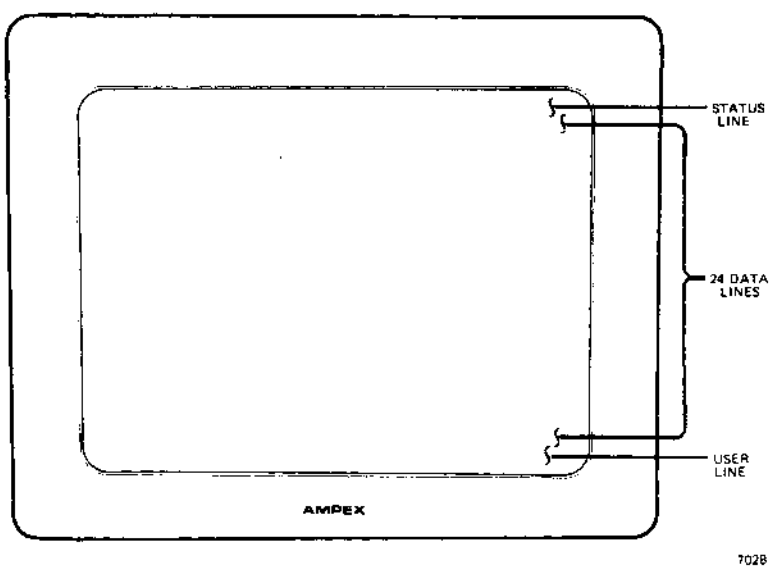


Figure 1-5. Terminal, Display Areas

1.2.1.1 Status Line

The Status Line (top of the screen) reports on the operating status of the terminal: caps lock, time of day, printing, operation attributes ("modes"), video attributes, DSR status, and cursor position. See Figure 1-6 for a complete listing of possible status entries.

The Status Line may be turned off (Set-Up, Line 1: STAT OFF). The CAPS indicator may also be turned off (Set-Up, Line 3: CAPS OFF). The contents of the Status Line may be sent to the computer (see "SENDING" in Section III).

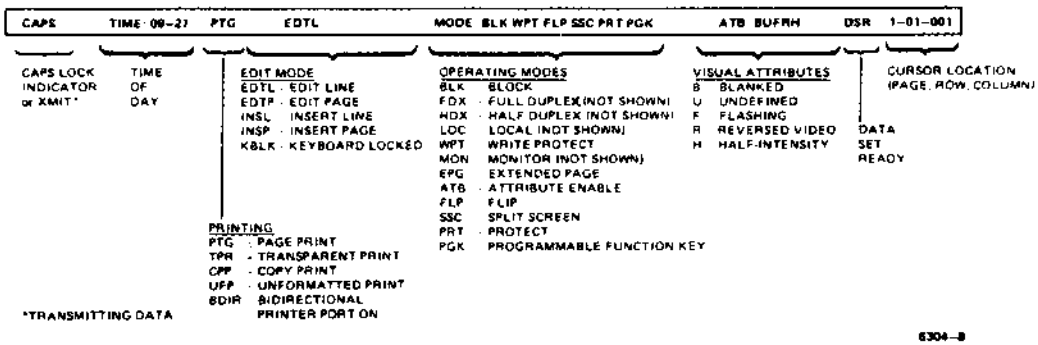


Figure 1-6. Terminal, Status Line

1.2.1.2 User Line

The User Line (bottom of screen) is a "free" line reserved for operator or application program entries. The length of the User Line depends upon the line length chosen in Set-Up: 80 or 132 columns.

Ordinarily, the User Line is not displayed.

To turn the User Line ON,

enter the sequence **ESC g**

To turn the User Line OFF,

enter the sequence **ESC h**

To enter data onto the User Line,

1. Enter the sequence **ESC f**
2. Type in the desired message.
3. Press RETURN (to signal the end of the message).

The contents of the User Line may be sent to the computer (see "SENDING" in Section III).

1.2.2 Interface Cable Connections

The *Ampex 230 plus* terminal has two standard RS232C serial port interfaces (Figure 1-4). One, the "PRIMARY" port, is used to connect the terminal to a host computer. The other, the "PRINTER" port, is used to connect the terminal directly to a printer (a printer may be connected directly to the computer).

To connect the terminal to the computer and/or printer, use a standard RS232C serial cable with a male connector on the terminal end. The type of connector on the opposite end of the cable depends on the connector of the computer (/modem/printer).

The maximum length for an RS232C cable connecting the terminal and other equipment is 50 feet.

NOTE

It is recommended that you use only shielded and jacketed cable. Using such a cable will help minimize electromagnetic interference, protecting your terminal and any other electronic devices near the terminal.

When connecting the terminal to other equipment, make sure that pins on the terminal connector are matched properly with the pins on the connector of the other equipment (see Section V). Pin assignments for the primary and printer port are given below.

Table 1-1 provides pin signal assignments for the primary port. Table 1-2 provides pin signal assignments for the printer port.

1.2.2.1 Optional Interface Connections

The RS232C connection of the primary port may be replaced by either of two optional interface connections:

RS422 Interface (for more speed)
20 mA Current Loop Interface (for greater cable length)

These options are available in kits from Ampex and may be ordered through your Ampex Sales Representative. When ordering, be sure to specify the part number for the desired kit:

RS422 Interface Kit: Ampex Part No. 3515412-02A
Current Loop Interface Kit: Ampex Part No. 3515413-02A

Procedures for installing both options are given in Appendix B.

Table 1-1. Primary Port Pin Signal Assignments

Pin No.	Signal Name	Signal Direction
1	Chassis ground	
2	Transmit Data	From Terminal
3	Receive Data	To Terminal
4	Request-to-Send	From Terminal
5	Clear-to-Send	To Terminal
6	Data-Set-Ready	To Terminal
7	Signal Ground	
8	Data Carrier Detect	To Terminal
20	Data-Terminal-Ready	From Terminal

Table 1-2. Printer Port Pin Signal Assignments

Pin No.	Signal Name	Signal Direction
1	Protective ground	
2	Transmit Data	To Terminal
3	Receive Data	From Terminal
4	Request-to-Send	To Terminal
5	Clear-to-Send	From Terminal
6	Data-Set-Ready	From Terminal
7	Signal Ground	
8	Data Carrier Detect	From Terminal
20	Data-Terminal-Ready	To Terminal

1.3 ON/OFF Switch

The ON/OFF (power) switch is a rocker-type switch located to the right rear of the unit.

1.3.1 Power On Procedures

When you turn on the terminal, it performs a self-test to make sure it is working properly.

This self-test operation checks the following areas/functions:

CMOS RAM (a check sum of the terminal's set-up information)
DATA RAM
DISPLAY RAM
ROM
VISUAL ATTRIBUTES (displays the test pattern*)

NOTE: the results of the self-test do not depend on whether or not the terminal is connected to a computer and/or printer; i.e., you can check the terminal is working properly without first connecting it in your system.

To turn on the terminal:

1. Plug the power cord into the proper outlet or receptacle.

   Make sure all interface cables are connected properly.

2. Set the on/off switch to ON (rear "swing" down).

IF THE SELF-TEST FINDS NO PROBLEMS,

the cursor will appear in the HOME position (the upper left corner of the screen). The terminal is ready for use.

* The test pattern shows all character sets, the different video attributes of characters, the version number of the terminal's firmware, and manufacturer copyright information. Ordinarily, the test pattern is not displayed during the power-on self-test.

IF THE SELF-TEST UNCOVERS A PROBLEM,

one of the following messages may appear:

CMOS CHECKSUM ERROR	ROM ERROR
DATA RAM ERROR	DISPLAY RAM ERROR

If you get CMOS CHECKSUM ERROR, do the following:

press SHIFT/NO SCROLL (= SETUP)
press SHIFT/D
press SHIFT/NO SCROLL (= SETUP)
press SHIFT/S.
turn the terminal off and then back on.

If the message does not appear, you are ready to proceed.
If the message reappears, contact your service representative.

If you get one of the other messages, do the following:

press CTRL/SHIFT/RESET

If the message does not appear, you are ready to proceed.
If the message reappears, contact your service representative.

1.3.2 Resetting the Terminal

Resetting the terminal returns the terminal to its state at power-on (nothing displayed, nothing in memory) and initiates a self-test; but power remains on.

To reset the terminal and clear the screen,

press CTRL/SHIFT/RESET

1.5 Locking and Unlocking Keyboard

It is possible to "lock" the keyboard. If the keyboard is locked, "KB LK" appears on the Status Line. Typing or pressing any key (or combination) is ignored, except for

CAPS LOCK
CTRL/SHIFT/RESET
SHIFT/NO SCROLL (= SETUP)

To lock the keyboard
- Via the keyboard, press SHIFT/NO SCROLL (=SETUP) and change KB ON to KB OFF (Line4), or
- enter or receive from the host the sequence **ESC #**

To unlock the keyboard -

a. Do the following:

1. Go to the Set-Up procedures (Press SHIFT/NO SCROLL).
2. Press the Down Arrow twice to move to Set-Up Line 3.
3. Press the Right Arrow until "KB OFF" is highlighted.
4. Press the space bar to change KB OFF to KB ON.
5. Press SHIFT/NO SCROLL to exit Set-Up. OR

b. Press CTRL/SHIFT/RESET to reset the terminal to default settings (KB ON); or

c. Receive from the host the sequence **ESC "**

1.6 INDICATORS

The terminal has two audio indicators. Although they have been set to ON, they can be turned off in Set-up.

Indicator	Meaning
Keyclick	Sounds whenever an alphabetic (a, b, c) or numeric (1, 2, 3) character key is typed.
Bell	Sounds (a) when the terminal self-test is completed, (b) when typed characters approach the right margin (column 72 if line length = 80; column 120 if line length = 132), (c) when the terminal receives a bell control code .

SECTION II
SETTING UP

INTRODUCTION

The *Ampex 230 plus* terminal is designed to operate in a variety of ways, attached to a variety of equipment. In order to make sure that the terminal will work properly with your particular configuration of equipment, you must first set it up; i.e., you must customize it to work with your equipment.

This section explains the options available in Set-up mode, how to enter and exit Set-up mode, how to change settings, and how to save the changes.

2.1 ENTERING SET-UP MODE

To enter Set-Up mode, press SHIFT/NO SCROLL = SET UP. When you first enter Set-Up mode, current parameter values are displayed.

Entering Set-Up signals (XOFF or DTR Low) the host to stop transmission. Exiting Set-Up signals (XOFF or DTR High) the terminal to resume transmission.

2.1.1 Set-Up Lines

There are eight lines of parameters for customizing operation of the terminal. Each line displays as the 26th (bottom) line on the screen. Each option is contained in a "field", displayed in half-intensity, reverse video (dark letters against light background). The cursor appears as a flashing block during set-up.

To move the cursor between fields on a set-up line, use the appropriate arrow key:

Arrow Key	Moves cursor to
LEFT	Preceding field, if any
RIGHT	Following field, if any

To view another set-up line, press the appropriate arrow key:

Arrow Key	Moves cursor to
UP	Preceding line, if any
DOWN	Following line, if any

2.1.2 Modifying Parameters

The fields on each set-up line denote an option which determines how the terminal will behave when you exit Set-up mode. The nature of the parameter is suggested by the particular value displayed in the field; e.g., "USA" is one of the settings for the (implied) option, desired national character set.

The setting visible in a field when you first enter Set-Up mode is the setting in effect.

To see the other valeus for a parameter, continue pressing the Spacebar or the "T" key.

If you wish to change to a new setting, scroll though the choices until the desired setting is visible in the field. I.e., the value displayed will be the value put in effect when you exit.

Changes to parameters are not made permanent until you save them.

2.1.3 Exiting and Saving Changes

Changes to parameters are not made permanent until you save them to non-volatile memory. Once saved, they remain in non-volatile memory until you save new changes.

To save setting(s) as changed, press **SHIFT/S** (simultaneously press the SHIFT and S keys). SHIFT/S saves the settings and causes the terminal to exit Set-Up Mode. These settings remain in effect until you save new ones.

The following fields revert to their default setting when you turn the terminal off and then on:

Field	Default Setting
Auxiliary port status	AUX OFF
Editing mode	EDTL
Graphics mode	GRAPH OFF
Keyboard lock	KB ON
Number of lines per page	24 LN/PG
Page-to-page scrolling	FLIP OFF
Printer port communication	BIDIR OFF
Time of day	08-00

2.1.4 Exiting with Temporary Changes

Changes to parameters may also be temporary; i.e., they remain in effect until new changes are made or until the terminal is turned off.

To leave Set-Up with temporary changes, press **SET-UP** (SHIFT/NO SCROLL).

The values in non-volatile memory are not affected when you exit Set-Up in this way.

2.1.5 Retrieving Previous Values

Because changes to parameters are not permanent until you save them, you can recall the set of last-saved values.

To recall last-saved values, enter **SHIFT/R** while viewing any of the Set-Up lines. The settings will be restored and the terminal will exit the Set-Up mode.

2.1.6 Retrieving Default Values

You can also quickly return all settings to their initial, or "default", values (the ones set at the factory).

To recall the default values and exit Set-Up, press **SHIFT/D**.

NOTE: SHIFT/D also returns any programmed function or editing key to its default value (see Section III for instructions on how to program these keys).

2.2. SET-UP LINES

There are a total of eight Set-Up lines containing operating parameters and feature selections.

SET-UP LINE	SETS PARAMETERS FOR
1	Emulation mode, keyboard character set, appearance of the display
2	Appearance of the display; Operation of the keyboard
3	Miscellaneous, including Enhanced emulation
4	Appearance of the display; Operation of the keyboard
5	Primary port, i.e., communication with host computer.
6	Printer port, i.e., communication with printer.
7	End of message terminators; Contents and transmission of initial greeting to host computer.
8	Tab stop settings.

CONV	FDX	A230+	USA	STAT ON	NOR VID	BLK FLH	PROT=H.I.	LN ATB	EDTL	80 COL	60 HZ
BLOCK LOCAL	HDX	TV950 TV924 VP–A1 VP–A2 WY–50 A210 TV925 TV910 TV920 H1500	UK FRE GER SWD NOR SPN ITY DAN	STAT OFF	REV VID	BLK CUR UDL FLH UDL CUR CUR OFF	PROT=BOTH PROT=NORM PROT=REV	PG ATB	EDTP INSL INSP	132 COL	65 HZ

6304–1A

Figure 2-1. Set-Up Line 1

SAVE ON	WRAP ON		SCROLL ON	JUMP ON	FLIP OFF	24 LN/PG	GRAPH OFF
SAVE OFF	WRAP OFF	AUTO TAB ON AUTO TAB OFF	SCROLL OFF	SM–1 ON SM–2 ON SM–4 ON SM–8 ON	FLIP ON	48 LN/PG 96 LN/PG	GRAPH ON

6304–2

Figure 2-2. Set-Up Line 2

SAVER FLH	CAPS ON	ENHANCE OFF	LEAD–IN=ESC	
SAVER BLN	CAPS OFF	ENHANCE ON	LEAD–IN="	

6304–9

Figure 2-3. Set-Up Line 3

DUPE	KLIK ON	RPT ON	BELL OFF	LWCS		CR=CR	KB ON	EMBED	TIME:08-00
LOCE	KLIK OFF	RPT OFF	BELL ON	UPCS	DOWN Λ/V DOWN V/J	CR=CRLF	KB OFF	NONEMB	

6304–3

Figure 2-4. Set-Up Line 4

HOST XMIT = 9600	RECEIVE = XMIT	BIT 8 = 0	STOP 1	PAR OFF	NO PARCHK	DTR ONLY
19200	19200	BIT 8 1	STOP 2	PAR ODD	PAR CHECK	XON ONLY
38400	38400	7 BITS		PAR EVEN		DTR & XON
50	50					[illegible]
75	75					
110	110					
134.5	134.5					
150	150					
300	300					
600	600					
1200	1200					
1800	1800					
2400	2400					
3600	3600					
4800	4800					
7200	7200					
	9600					

6304–4

Figure 2-5. Set-Up Line 5

AUX BAUD 9600	BIT 8 = 0	STOP 1	PAR OFF	DTR ONLY	AUX OFF	BDIR OFF
19200	BIT 8 =1	STOP 2	PAR ODD	DTR & XON	AUX ON	BDIR ON
38400	7 BITS		PAR EVEN		TPR ON	
50						
75						
110						
134,5						
150						
300						
600						
1200						
1800						
2400						
3600						
4800						
7200						
9600						

6304–5

Figure 2-6. Set-Up Line 6

FIELD=	HEOL =	STPROT=	ENPROT=	HEOM =	ANSWER BACK=

6304–6

Figure 2-7. Set-Up Line 7

1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890

6304–7

Figure 2-8. Set-Up Line 8

2.2.1 Set-Up Line 1

Field	Other	Description
CONV	BLOCK LOCAL	Sets nature of link between terminal and host computer. CHAR allows immediate data transmission between terminal and the host computer; BLOCK allows for text entry and editing before sending data to the host computer; LOCAL allows for text entry and editing without transmitting to host.
FDX	HDX	Sets method of communication with host. Set to FDX (full duplex) if host echoes codes received from terminal back to the terminal. Set to HDX (half duplex) if host does not echo codes back to terminal.
A230+	TV950 TV924 VP-A1 VP-A2 WY-50 A210 TV925 TV910 TV920 H1500	Sets general operating characteristics of terminal, to native mode or to an emulation. A230+ Ampex 230 plus TV950 TeleVideo 950 TV924 TeleVideo 924 VP-A1 Viewpoint A1 VP-A2 Viewpoint A2 WY-50 Wyse 50 A210 Ampex 210 TV925 TeleVideo 925 TV910 TeleVideo 910 TV920 TeleVideo 920 H1500 Hazeltine 1500
USA	UK FRE GER SWD NOR SPN ITY DAN	Sets national character set of keyboard: USA American English UK British English FRE French GER German SWD Swedish NOR Norwegian SPN Spanish ITY Italian DAN Danish
STAT ON	STAT OFF	Sets whether or not to display status line during normal operation.
NOR VID	REV VID	Sets appearance of characters against screen background. If NORVID (normal video), light characters appear against a dark background. If REVVID (reverse video), dark characters appear against a light background.

BLK FLH	BLK CUR UDL FLH UDL CUR CUR OFF	Sets appearance of cursor. BLK FLH — Flashing block BLK CUR — Steady block UDL FLH — Flashing underline UDL CUR — Steady underline CUR OFF — Not displayed
PROT=H.I.	PROT=BOTH PROT=NORM PROT=REV	Sets the video attributes of characters in protected fields: H.I. — half intensity BOTH — reverse video & half -intensity NORM — normal REV — reverse video
LN ATB	PG ATB	Sets scope of affected characters when using embedded video attributes. If LN ATB, characters affected are only those to the end of the line containing the cursor. If PG ATB, characters affected are all those to the end of the screen.
EDTL	EDTP INSL INSP	Sets style and scope of editing (see Section III): EDTL — replace characters, to end of line EDTP — replace characters, to end of page INTL — insert characters, to end of line INTP — insert characters, to end of page
80 COL	132 COL	Sets number of columns (line length) to be displayed.
60 HZ	65 HZ	Sets refresh rate of screen. Set to 65 HZ to eliminate flicker. Set to 60 HZ if outside electromagnetic interference causes the screen image to wave or move.

2.2.2 Set-Up Line 2

Field	Other	Description
SAVE ON	SAVE OFF	Turns on/off CRT Saver. If SAVE ON, CRT Saver is ON. Then, if terminal is left on but data is not entered for a period of 10 minutes, displayed characters disappear. Pressing a key or receiving data causes previously displayed characters to reappear.
WRAP ON	WRAP OFF	Sets effect of data which exceeds end of a line. If WRAP ON, cursor and subsequenct data wraps around to beginning of next line. If WRAP OFF, cursor remains at end of line and each subsequent character overwrites existing character in last column.
	AUTO TAB ON AUTO TAB OFF	(Only if emulation = TV924) Sets range of lines accessible by tabbing AUTO TAB ON entire screen AUTO TAB OFF current line only
SCROLL ON	SCROLL OFF	Sets effect of data which exceeds end of last line of a page. If SCROLL ON, all data moves up one line (on the page) to make room for new data. If SCROLL OFF, data remains in place; new data overwrites existing data, beginning at HOME position (of the page).
JUMP ON	SM-1 ON SM-2 ON SM-4 ON SM-8 ON	Sets method of scrolling data that is received from host. If JUMP ON, data is scrolled on the screen as fast as it is received from the host. If SM-n ON, data is scrolled one line at a time, at "n" lines per second.
FLIP OFF	FLIP ON	Sets "writing location" of data exceeding last line on a page. If FLIP OFF, data is written on the same page. If FLIP ON, data is written on the next page.
24 LN/PG	48 LN/PG 96 LN/PG	Sets number of lines per page; i.e., divides 96-line memory capacity into pages. (Lines/page affects, for example, way in which data is stored and scrolls.) Setting determines total number of pages available:

Setting	If 80 col	If 132 col
24 LN/PG	4	2
48 LN/PG	2	1
96 LN/PG	1	---

GRAPH OFF	GRAPH ON	Sets/indicates if graphics mode is in effect. If GRAPH ON, block and line graphic characters may be displayed (see Section III).

2.2.3 Set-Up Line 3

Field	Other	Description
SAVER FLH	SAVER BLN	Sets/indicates appearance of the Set-Up Line when the CRT Saver comes on. If SAVER FLH, the Set-Up Line flashes when displayed data disappears; if SAVER BLN, the Set-Up Line does not appear so that the entire screen is blank.
CAPS ON	CAPS OFF	Sets/indicates the appearance of the CAPS LOCK indicator if the Status Line is turned off (Line 1). If CAPS ON, "CAPS" appear in the Status Line area whenever the CAPS LOCK is in effect. If CAPS OFF, no indication is given in the Status Line area when CAPS LOCK is in effect.
ENHANCE OFF	ENHANCE ON	Sets availability of terminal's native features to an emulation, "enhancing" the emulated terminal's operation. Set to ENHANCE ON for the added features (programmable function keys, 132 column, graphics characters).
LEAD-IN=ESC	LEAD-IN=~	Indicates escape sequence's lead-in code for Hazeltine emulation.

2.2.4 Set-Up Line 4

Field	Other	Description
DUPE	LOCE	Sets whether or not certain edit key codes are transmitted to host. If DUPE, codes are transmitted. If LOCE, codes are not transmitted. Applies only if terminal is set to CONV and FDX (Line 1).
KLIK ON	KLIK OFF	Sets effect of typing a key. If KLIK ON, electronically synthesized "click" accompanies typing a key. If KLIK OFF, no sound accompanies typing a key.
RPT ON	RPT OFF	Sets effect of holding down a key. If RPT ON, held key will repeat. If RPT OFF, holding a key is same as typing key once: only one character results. NOTE: The following keys never repeat: BREAK FUNCT CAPS LOCK LOC ESC / ESC CLEAR / HOME RESET CTRL SHIFT
BELL OFF	BELL ON	Sets effect of cursor approaching right margin. If BELL ON, bell sounds when cursor reaches column 72 if 80 COL, column 120 if 132 COL.
LWCS	UPCS	Sets the effect of pressing an alphabet key at power-up. If UPCS, it produces an upper case character (CAPS appears on the Status Line). If LWCS, it produces a lower-case character.
	DOWN ^/V DOWN ^/J	(Only if emulation = TV924) Sets code transmitted by pressing DOWN arrow: If values is — Down Arrow generates DOWN^/V — CTRL/V DOWN^/J — CTRL/J
CR=CR	CR=CRLF	Sets terminal's response to a typed or received carriage return. If CR=CR, moves cursor to column 1 of the same line; if CR=CRLF, moves cursor to column 1 of the next line.
KB ON	KB OFF	Used to lock/unlock keyboard. KB OFF locks the keyboard; i.e., prevents data entry via keyboard.
EMBED	NONEMB	Sets the type of video attributes. If EMBED, a video attribute is assigned to a range and occupies a column position. If NONEMB, a video attribute is assigned on character-by-character basis. See Section III for more information.
TIME:08-00		Sets time of day (in 24-hour time). At power-up, set to 08-00. To set to another time, use arrow key to move cursor to desired location (hour, minute), then use the spacebar to scroll to the desired setting.

2.2.5 Status Line 5

Field	Other	Description
HOST XMIT = 9600	19200 38400 50 75 110 135 150 300 600 1200 1800 2400 3600 4800 7200	Sets the rate (bits/second) of transmitting data from terminal to host.
RECEIVE = XMIT	19200 38400 50 75 110 135 150 300 600 1200 1800 2400 3600 4800 7200 9600	Sets the rate (bits/second) of transmitting data from host by terminal. XMIT sets receive rate to send rate.
BIT 8=0	BIT 8 = 1 7 BITS	Sets the data word configuration (the number of bits when transmitting data between host and terminal) and the contents of Bit 8. 7 BITS means there is no eighth bit.
STOP 1	STOP 2	Sets the stop bit configuration.
PAR OFF	PAR ODD PAR EVEN	Sets the type of parity applicable to each data word transmitted.
NO PARCHK	PAR CHECK	Set PAR CHECK if the terminal requires a parity check for compatibility with host.
DTR ONLY	XON ONLY DTR & XON NONE	Sets the transmission protocol: DTR ONLY — Data Terminal Ready only XON ONLY — XON/XOFF only DTR & XON — Data Terminal Ready and XON/XOFF NONE — Neither DTR nor XON is used.

2.2.6 Set-Up Line 6

Field	Other	Description
AUX BAUD=9600	19200 38400 50 75 110 135 150 300 600 1200 1800 2400 3600 4800 7200	Sets the rate (bits/second) of transmitting data through the printer port.
BIT 8 = 0	BIT 8 = 1 7 BITS	Sets the data word configuration (the number of bits when transmitting data between host and terminal) and the contents of Bit 8. 7 BITS means there is no eighth bit.
STOP 1	STOP 2	Sets the stop bit configuration for sending data to the printer port.
PAR OFF	PAR ODD PAR EVEN	Sets the type of parity applicable to each data word transmitted to the printer port.
DTR ONLY	DTR & XON	Sets the transmission protocol: Setting — Protocol DTR ONLY — Data Terminal Ready only DTR & XON — Data Terminal Ready and XON/XOFF
AUX OFF	AUX ON TPR ON	Sets the status of the printer port, usually where data received from the host is sent: AUX OFF — screen only AUX ON — screen and printer port TPR ON — printer port only NOTE: During execution of page print command, message "PTG" appears.
BDIR OFF	BDIR ON	Sets the direction of communication between the printer port and the host. If BIDIR ON, host can transmit to printer, but printer can also communicate with the host. If BIDIR OFF, only transmission is from host to printer.

2.2.7 Set Up Line 7

Field	Description
FIELD=$^{F}_{S}$	Sets characters sent in place of protected field, when protected fields are not transmitted. Type in desired characters. Any two characters acceptable; default is FS (field separator) = 1C (hex). NOTE: if mistake made in typing, use Arrow key to leave field. Then return to field and type in correct characters.
HEOL = $^{U}_{S}$	Set to match host's end of line terminator. Type in desired characters. Any two characters acceptable; default is US (unit separator) = 1F (hex). NOTE: if mistake made in typing, use Arrow key to leave field. Then return to field and type in correct characters.
STPROT=$^{E}_{C)}$	Sets characters sent denoting start of protected field, when protected fields are transmitted. Type in desired characters. Any two characters acceptable; default is E(s)C). NOTE: if mistake made in typing, use Arrow key to leave field. Then return to field and type in correct characters.
ENPROT=$^{E}_{C(}$	Sets characters sent denoting end of protected field, when protected fields are transmitted. Type in desired characters. Any two characters acceptable; default is E(s)C (. NOTE: if mistake made in typing, use Arrow key to leave field. Then return to field and type in correct characters.
HEOM = $^{C}_{R}$	Set to match host's end of message terminator. Type in desired characters. Any two characters acceptable; default is CTRL/M (carriage return). NOTE: if mistake made in typing, use Arrow key to leave field. Then return to field and type in correct characters.
ANSWER BACK =X.X,1	20 character field for ANSWERBACK message to host, identifying terminal to the host. First and last characters serve as delimiters (not transmitted) and must be the same. Default message is "X.X, n". X.X denotes the firmware version; "n" denotes the number of pages set up in screen memory (0 means 1 page, 1 means 2 pages, and so on). NOTE: if mistake made in typing, use Arrow key to leave field. Then return to field and type in correct characters.

2.2.8 Set Up Line 8

Tab stops are not saved when the terminal is turned off. Thus, when you first turn on or reset the terminal, there are no tabs set. If you want to use tab stops, you must first set them. Tab stops may be set in any column. Tab stops may be set or cleared in one of two ways, in Set-Up or by using an escape sequence.

In Set-Up

To set a tab stop,

1. Move the cursor to the desired column.
2. Press the space bar. A "T" appears in the column.

To clear an existing tab stop,

1. Move the cursor to the appropriate stop.
2. Press the space bar. The "T" disappears from the column.

Using an Escape Sequence

Tabs may also be set or cleared during normal operation without entering SET-UP.

To set a tab stop

1. Move the cursor to the desired column.
2. Press or execute via the host the sequence **ESC 1**.

NOTE

If write-protection is ON, this command generates a vertical column of half-intensity spaces, from the row on which the cursor is positioned down to the first row containing a protected character in the column or to the end of the page, whichever comes first.

To clear an existing tab stop,

1. Move the cursor to the appropriate stop.
2. Press or execute via the host the sequence **ESC 2**.

NOTE: If write-protection is ON, this command has no effect.

To clear all tab stops,

1. Enter or execute via the host the sequence **ESC 3**.

NOTE: If write-protection is ON, this command has no effect.

SECTION III
OPERATING AND PROGRAMMING THE TERMINAL

INTRODUCTION

This section explains how to operate and program the *Ampex 230 plus* terminal using its native characteristics; i.e., when it is not emulating another terminal. Emulating another terminal is discussed in Section IV.

3.1 ' OPERATING MODES

The *Ampex 230 plus* terminal has basically three "operating modes"; two of these allow communication between the terminal and a host computer. The desired operating mode may be chosen while in Set-Up or by entering the appropriate escape code (see below).

Table 3-1. Operating Mode Escape Codes

Operating Mode	Escape Code
Conversation	ESC C
Block	ESC B
Local	

Table 3-2. Description of Operating Modes

Operating Mode	Description
Conversation	Data entered via the keyboard is transmitted immediately to the host. Its appearance on the screen depends on whether or not echoing is in effect (see "Communications Mode" below). Editing command codes are transmitted to the host, interpreted and acted upon, with the results displayed on the screen. Printing may be either executed via the host or initiated from the keyboard.
Block	Data entered via the keyboard is displayed immediately but is not transmitted to the host until a SEND command is given. Editing is "local": editing commands are interpreted and acted upon by the terminal. Printing may be either executed via the host or initiated from the keyboard.
Local	Data entered via the keyboard is displayed immediately and is never transmitted to the host. Editing is "on-screen": editing commands are interpreted and acted upon by the terminal. Printing is initiated only from the keyboard.

3.1.1 Communications Mode

Proper display of data on the terminal screen depends in part on the communications setup of the host computer. In particular, host computers may or may not send back ("echo") for display on the terminal's screen data entered via the keyboard and transmitted to the host. If the host does not echo, then the terminal must transmit both to the host and to the screen.

Proper display then depends on choosing the right "communication mode" for the terminal.

If the host is set to echo data,

> In Set-Up, set the duplex to FDX (full duplex), or
> Enter the sequence **ESC D F**

If the host is set to not echo data,

> In Set-Up, set the duplex to HDX (half duplex), or
> Enter the sequence **ESC D H**

NOTE: if the host is set to echo and duplex is set to HDX, all characters will display double. If the host is set to not echo and duplex is set to FDX, no characters will be displayed.

Editing and the Communications Mode

Most of the time (e.g., using a word processing program), editing will be done while in Full Duplex (FDX on Line 1) Conversation (CONV on Line 1) and Duplex Edit (DUPE on Line 3) mode. In this situation, the editing and cursor-moving keys are transmitted to the host and echoed back to the screen. [NOTE: if an application program cannot interpret the code transmitted by the key, the command will usually be ignored. NOTE also: You can program a key so that it transmits a code the application can interpret. See "Programming"]

In some configurations, it may be appropriate to use an alternative to Duplex Editing, Local Editing. In Local Editing, editing is on-screen, the terminal does not transmit codes for the following keys to the host:

Arrow Keys (Up, Down, Left, Right)

BACKSPACE	ERASE LINE
BACKTAB	ERASE PAGE
CLEAR	INSERT CHARACTER
DELETE CHARACTER	INSERT LINE
DELETE LINE	HOME
ENTER	CE
PAGE	PRINT
SEND	TAB

NOTE: communication between terminal and host may break down if you switch from Duplex Editing to Local Editing and back to Duplex Editing. For example, if you move the cursor while in Local Editing, and then return to Duplex Editing, the host thinks the cursor is in one position, when it is actually in another.

To turn on Local Editing,

in Set-Up (Line 3), choose LOCE, or
enter the sequence **ESC k**

To turn off Local Editing (return to Duplex Editing),

in Set-Up (Line 3), choose DUPE, or
enter the sequence **ESC l** (lower case l).

3.2 DISPLAYING DATA

There are several choices which affect how all data is displayed on the screen.

3.2.1 Video Background

The background may be set to either normal (light letters against a dark background) or reverse (dark letters against a light background) video, either by going into Set-Up (Line 1) or by using one of the following sequences

Video	Sequence	Set-Up
normal	**ESC d**	NOR VID
reverse	**ESC b**	REV VID

3.2.2 Video Attributes

Each character displayed on the screen has two components: a datum attribute (essentially, what letter it is) and a video component (its appearance on the screen). The video attribute of characters may be changed, either before or after entering the character.

Video

In addition to normal (the same as the background), a character may be displayed with any of five attributes:

blank (character not displayed)
flash
reverse (opposite the background)
underline
half-intensity (dim)

and with any combination of these: e.g.

underline reverse
underline reverse flash
flash half-intensity

A particular video attribute or combination is inititated by a three-character escape sequence:

ESC G n

where "n" is the value associated with the attribute or combination. The value of "n" associated with each attribute is given in Table 3-3.

The effect of the sequence depends on whether attributes are embedded or not embedded.

Table 3-3. Video Attribute Escape Sequences

Attribute	Escape Sequence ESC G ...
normal	0
blank	1
flash	2
blank flash	3
reverse	4
blank reverse	5
flash reverse	6
blank flash reverse	7
underline	8
blank underline	9
flash underline	:
blank flash underline	;
reverse underline	<
blank reverse underline	=
flash reverse underline	>
blank flash reverse underline	?
normal H.I.	p
blank H.I.	q
flash H.I.	r
blank flash H.I.	s
reverse H.I.	t
blank reverse H.I.	u
flash reverse H.I.	v
blank flash reverse H.I.	w
underline H.I.	x
blank underline H.I.	y
flash underline H.I.	z
blank flash underline H.I.	{
reverse underline H.I.	|
blank reverse underline H.I.	}
flash reverse underline H.I.	~
blank flash reverse underline H.I.	DEL

3.2.2.1 Embedded Attributes

If a video attribute is embedded, it changes the appearance of all characters in its "range". Data already in the range or data entered into the range appears with the assigned attribute.

An embedded attribute's range is either the column position* occupied by a different embedded attribute or the "end" (of the current line or current page, depending on the setting in Set-Up, Line 1).

Setting	Range ends at the
LN ATB	Line
PG ATB	Page

* An embedded attribute occupies a column and overrides any character previously entered in the column.

To select embedded video attributes,
In Set-Up (Line 3), choose EMBED, or
Enter the sequence **ESC . 7**

FOR EXAMPLE, if row 1 reads:

Now is the time for all good men to come to the aid of their terminal.

to make "all" flashing,

1. Move the cursor to column 20.
2. Enter the sequence ESC . 7 (for embedded attributes)
3. Enter the sequence ESC G 2 (all characters after column 21 begin flashing; the embedded attribute occupies column 20).
4. Move the cursor to column 24.
5. Enter the sequence ESC G 0 (all characters after column 25 appear normal; the embedded attribute occupies column 24).

3.2.2.2 Non-Embedded Attributes

If a video attribute is non-embedded, each character subsequently entered anywhere on the screen has the asssigned attribute. (Note: a non-embedded attribute does not take up a column.)

To select non-embedded video attributes,
In Set-Up (Line 3), choose NONEMB, or
Enter the sequence **ESC . 8**

FOR EXAMPLE, if row 1 reads:

Now is the time for all good men to come to the aid of their terminal.

to make "Now" and "all" flashing,

1. Move the cursor to column 1.
2. Enter the sequence ESC . 8 (for non embedded attributes)
3. Enter the sequence ESC G 2 (typed characters will appear flashing).
4. Type "Now".
6. Move the cursor to column 21.
7. Type "all".
8. Enter the sequence ESC G 0 (typed characters will appear normal).

Defining a Range for Non-Embedded Attributes

With the *Ampex 230 plus* terminal, you can also define a range for non-embedded attributes. Characters in the range will have the assigned attribute.

To define a range for non-embedded attributes, enter the sequence

ESC . B r c R C

where r, c denote the beginning row and column of the range (see Appendix G)
R, C denote the ending row and column of the range (see Appendix G)

NOTE

The particular attribute assigned to the range is the attribute in effect when the range is defined. In other words, enter the sequence for the desired attribute before entering the sequence specifying the range.

FOR EXAMPLE, if rows 1 and 2 read:

```
Now is the time for all good men
to come to the aid of their terminal.
```

to make "all good men to come to " underlined and half-intensity,

1. Enter the sequence ESC G x (for underline half-intensity).
2. Enter the sequence ESC . B space 4 !) (for the range). All characters in row 1, column 21 and beyond and all characters in row 2 up to column 10 appear underlined and dimmed.

3.2.2 Displaying All Characters

Usually, only alphabet and numeric characters are displayed when entered. Pressing the CTRL key, the ESC key, the Backspace key or similar keys enters a code but no character is displayed. These characters may be displayed however (see Appendix H for a list of the characters and their meaning).

To display but not interpret all characters (sometimes called "monitor mode"), including escape sequences and control characters, enter one of the sequences

ESC U
CTRL/1

To return to the usual display of characters, enter one of the sequences

ESC X
CTRL/2
ESC u

3.2.3 Double Size Characters

The terminal is capable of displaying characters twice the height and/or twice the width of standard-size characters.

The basic procedure is

1. Move the cursor to the desired row.
2. Enter the escape sequence for the desired size. Characters already on the row or characters you then type onto the row will have the desired size.

Double-High

A double-high character is formed using two adjacent rows: the top half of the character appears on the higher row, the bottom half appears on the lower row. Thus, to get the resulting effect of double-high characters, the same characters must appear twice, once on each row.

To enter the top of the each character:

1. With the cursor on the upper row, enter the sequence **ESC m 1**
2. Type in the desired characters.

To enter the bottom half of each character:

1. With the cursor on the lower row, enter the sequence **ESC m 2**
2. Type in the same characters as above.

To return to a row of double-high characters to single-high characters,

1. With the cursor on the appropriate row, enter the sequence **ESC m 0**

Double-Wide

A double-wide character is formed using adjacent columns on the same line: each letter fills two columns. NOTE: when you specify double-wide characters for a row, any characters in the right half of the row are lost.

To enter double-wide characters:

1. With the cursor on the desired row, enter the sequence **ESC p 1**
2. Type in the desired characters.

To return a row of double-wide characters to single-wide characters,

1. With the cursor on the appropriate row, enter the sequence **ESC p 0**

Double High and Wide

A double-high, double-wide character is formed by combining the two approaches above, using adjacent rows and adjacent columns to form each character. NOTE: when you specify double-wide characters for a row, any characters in the right half of the row are lost.

To enter the top of the each character:

1. With the cursor on the upper row, enter the sequences **ESC m 1 ESC p 1**
2. Type in the desired characters.

To enter the bottom half of each character:

1. With the cursor on the lower row, enter the sequence **ESC m 2 ESC p 1**
2. Type in the same characters as above.

To return to a row of double-high, double-wide characters to single-high, single-wide characters,

1. With the cursor on the appropriate row, enter the sequences **ESC m 0 ESC p 0**

3.2.4 Special Graphics Characters

The terminal is also capable of generating special line and block graphics characters. In other words, pressing a key will produce not an alphabet or numeric character, but a graphics character.

To turn on the graphics mode,
in Set-Up (Line 2), choose GRAPH ON; or
enter the sequence **ESC $**

To turn off the graphics mode,
in Set-Up (Line 2), choose GRAPH OFF; or
enter the sequence **ESC %**

The graphic generated by each key is given in Figure 3-1.

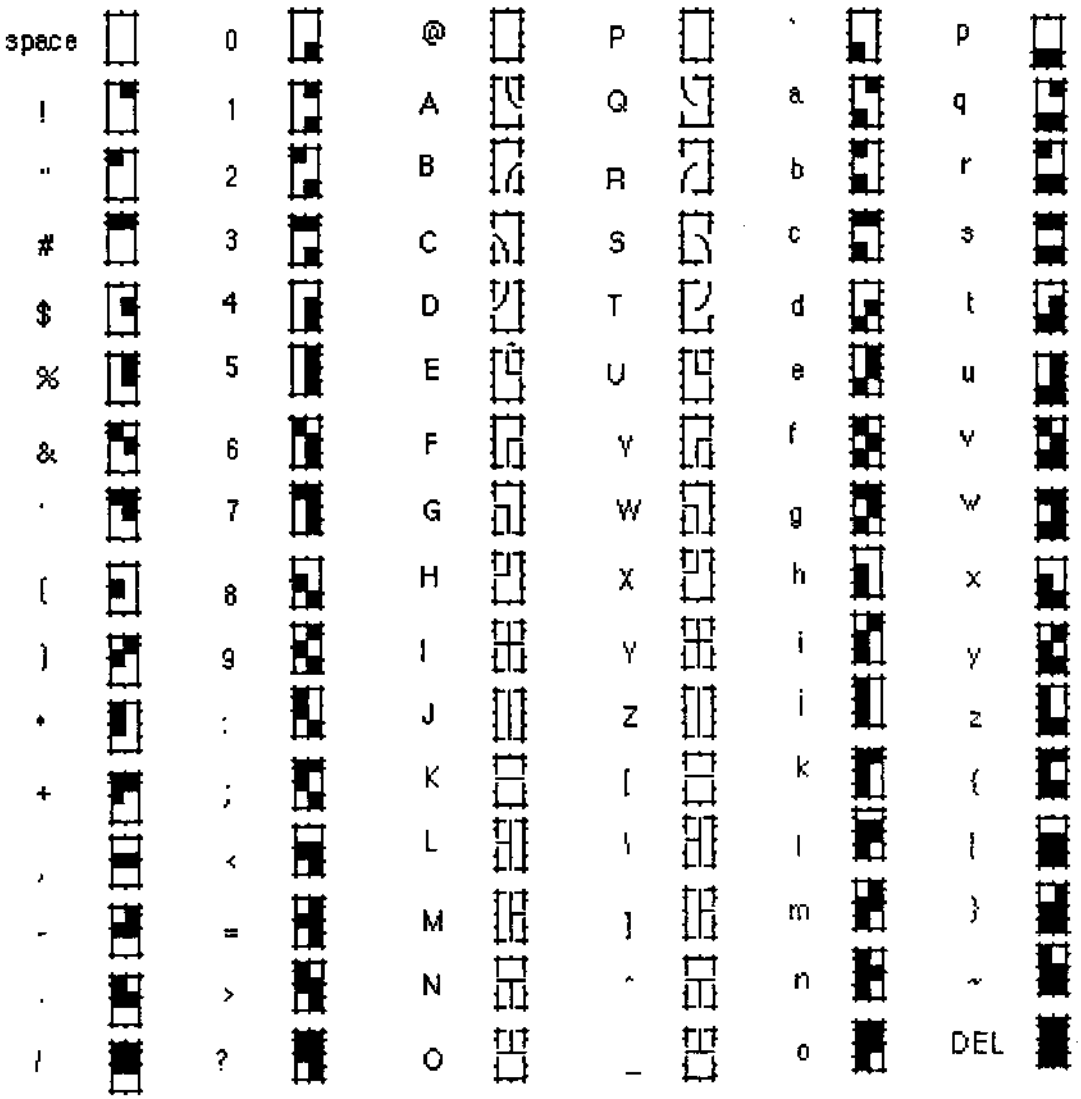


Figure 3-1. *Ampex 230 plus* Special Graphics

3.3 Scrolling and Flipping

The contents of the terminal's memory (what you enter at the keyboard and data received from the host) are displayed on the screen. The contents of the screen are stored in the terminal's memory.

"Scrolling" is the process of moving data from one line to an adjacent line (up or down). Data scrolls past the terminal's screen, like a film scrolls through a film projector. Data also scrolls in memory: as new data is received, existing data is pushed "up" a line.

To set the rate at which data scrolls,

in Set-Up (Line 2), choose
JUMP ON or
SM-n

where n = the number of scanning lines per second (1, 2, 4, 8).

If scrolling is set to JUMP ON, data scrolls as fast as it is received.

3.3.1 Scrolling and Page Size

If there were a one-to-one match between memory and screen (where each handled 24 lines of data), a line of data which scrolls "off" the screen would also scroll "out of" memory.

On the *Ampex 230 plus*, the screen handles 24 lines of data, but memory handles 96 lines. In this situation, the screen acts as a window into memory (see Figure 3-2).

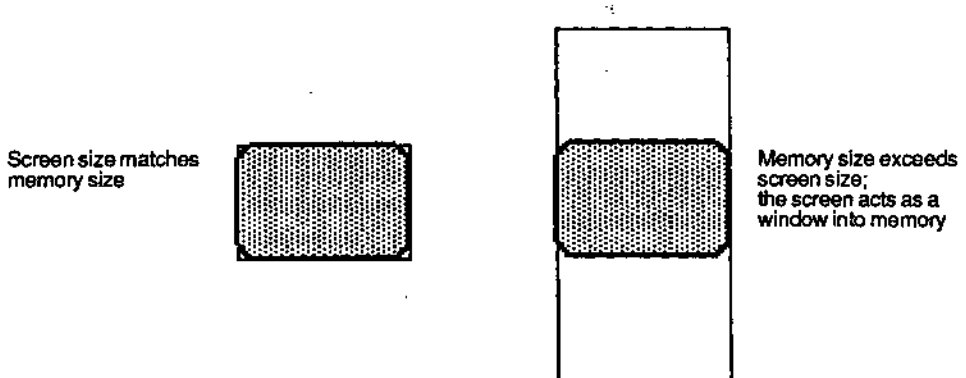


Figure 3-2. Screen Relative to Memory Size

The 96 lines of memory may be set up as 1, 2, or 4 pages (see Figure 3-3).

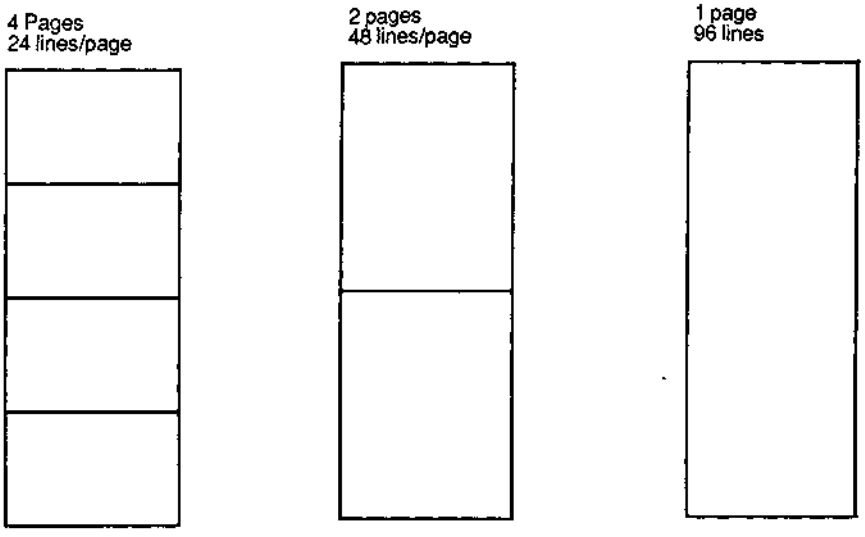


Figure 3-3. Alternative Page Divisions of Memory

Received data scrolls only on the current page, i.e., the page on which the cursor is located. Thus, the size of a-page determines how much new data can be stored before existing data is lost.

The size of a page (and thus the number of pages in memory) depends on two choices: the number of lines per page and the number of columns per line.

	Page Size (in characters)	
Lines/page	80 COL	132 COL
24	1920	3168
48	3840	6336
96	7680	---

Because the screen is a window, the line of data which scrolls off the screen need not be scrolling out of memory. And the line of data which scrolls out of memory need not be the one scrolling off screen (see Figure 3-4). The distinction here is important: what scrolls off the screen but remains in memory can be redisplayed; what scrolls out of memory is "lost", it cannot be redisplayed.

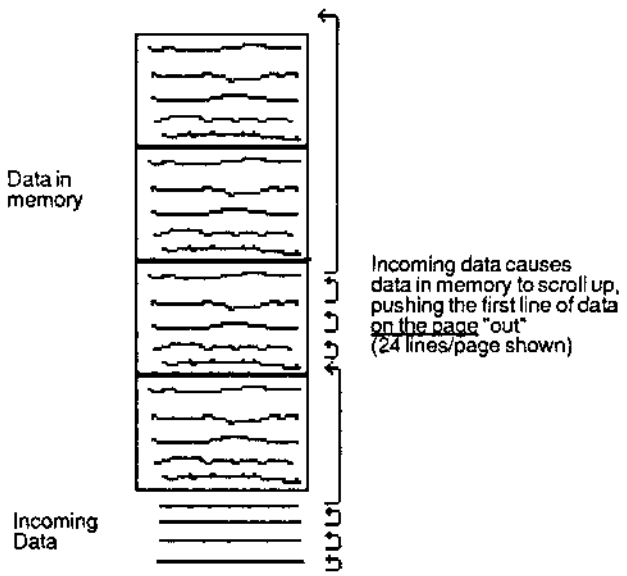


Figure 3-4. Scrolling Data

To change page length,

In Set-Up, choose	Or enter ESC \ ...
24 LN/PG	1
48 LN/PG	2
96 LN/PG	3

To set line length,

In Set-Up, choose	Or enter ESC [...
80 COL	5
132 COL	6

NOTE

Changing either line length or page length clears all data from both memory and screen.

3.3.2 No Scroll

Scrolling (in memory) may be turned off. If scrolling is off, data exceeding the last line of the page (i.e., typed data or received data which comes after the entry in the last column of the last line of the page) OVERWRITES data already on the page, beginning at the HOME position. (See Figure 3-5.)

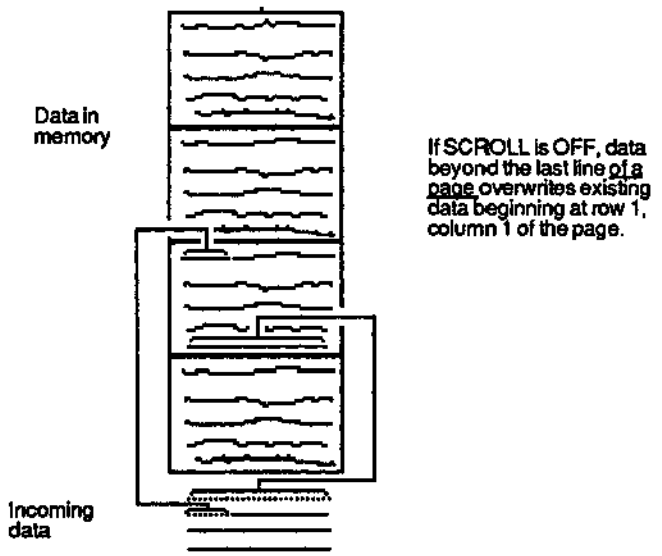


Figure 3-5. No Scroll

Note: If lines per page is 48 or 96, data will continue to scroll in the display, even if scrolling is turned OFF.

To turn off scrolling

In Set-Up (Line 2), choose SCROLL OFF

If scroll is	incoming data exceeding last line of page
on	is stored on last line, preceding data scrolls "up" one line, data on line 1 scrolls "out" of memory (is lost)
off	overwrites data already on page, beginning at row 1, column 1.

3.3.3 Customizing Scrolling

Ordinarily, the area of the screen in which data scrolls is the entire 24 rows; and the lines of memory in which data scrolls is the current page. For example, if the cursor is on page 2 when lines per page is 48, then the scrolling area of memory is lines 49 through 96.

Scrolling can be customized in two ways. One way, defining a scrolling region, is used to restrict the area of the screen, and the related area in memory, in which data may scroll. The other, locking lines, is used to exclude from scrolling certain rows of the screen, and their associated lines in memory.

NOTE: Customized scrolling applies only to the page on which it is set-up. E.g., if you customize scrolling on page 1, page 2 may scroll in the usual way.

NOTE also: When scrolling is customized, cursor addressing is relative to the customized area. For example, if a scrolling region has only 10 lines, the last line of the region is the tenth line.

NOTE therefore

Customizing scrolling when the lines/page is 48 or 96 is NOT recommended.

3.3.3.1 Defining a Scrolling Region

Defining a scrolling region simultaneously restricts scrolling

to a particular area of the screen
to a particular area of memory.

Any block of adjacent rows of the screen may be defined as the scrolling region. The associated lines in memory, i.e., the lines appearing in those rows when you define the region, determine the scrolling region of memory. In effect, it determines what lines of memory outside the scrolling region remain visible. (See Figures 3-6.)

To define a scrolling region, enter the sequence

ESC _ A B

where A top row of the screen scroll region (in ASCII) (see Appendix G)
B bottom row of the screen scroll region (in ASCII) (see Appendix G)

To reset scrolling to the full screen and the entire page, enter the sequence

ESC _ space 7

NOTE

If lines per page is 24, the row number is the same as the line number (cursor location). In all other instances, it is necessary to count in order to determine the (decimal) number of a row.

NOTE further

Once a scrolling region is defined, cursor location is determined by the scroll region. E.g., the first line of the scroll region is identified as line 1, the second line (if any) as line 2, and so on.

NOTE finally

Data exceeding the last line of the scrolling region pushes all preceeding lines of the region up one, so that the first line of data in the region is lost.

Example:

Suppose that Lines/page is 24.

To define a scrolling region of rows 10 through 15, enter the sequence

ESC _)

Received or typed data scrolls only on those rows. The first row of the region, row 10, is identified as line 1on the Status Line, row 11 as line 2, and so on up to row 15 as line 6. In this situation, the cursor cannot go beyond line 6.

When the entire screen again becomes the scrolling region, the data appearing on rows 10 through 15 scroll in the usual way.

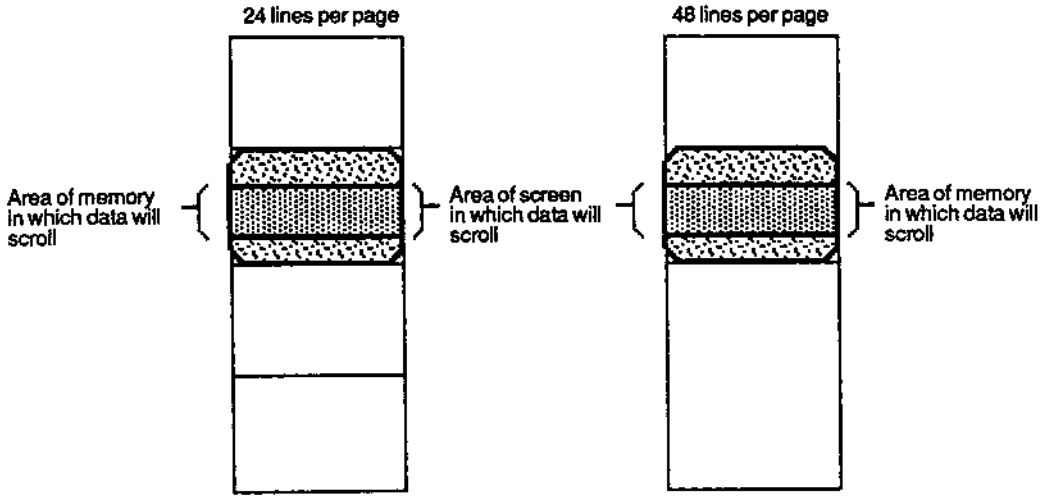


Figure 3-6. Scrolling Region

3.3.3.2 Locking Lines

Locking a line simultaneously excludes from scrolling

the row on the screen on which the cursor appears
the associated line in memory on which the cursor is located.

Any collection of rows may be locked; up to a total of 23. The associated line(s) in memory, i.e., the line on the row when the row is locked, is excluded from scrolling. In other words, the lines in locked rows remain on the screen when the page is on screen. All other lines of the page scroll. Together, the effect is like a window with louvers. (See Figures 3-7.)

To lock a line,

1. Move the cursor to the row to be locked
2. Enter the sequence **ESC ! 1**
3. Repeat steps 1 and 2 for each row to be locked.

To unlock all locked lines, enter the sequence

ESC ! 2

NOTE

When lines are locked, cursor location is determined by the scroll area. E.g., the first line of the scroll area is identified as line 1, the second line (if any) as line 2, and so on. The number of the last line of the scroll area is

Page size - number of locked lines

NOTE also

When all lines are again unlocked, data on previously locked rows resume scroll-order relative to the lines on screen. See the example below.

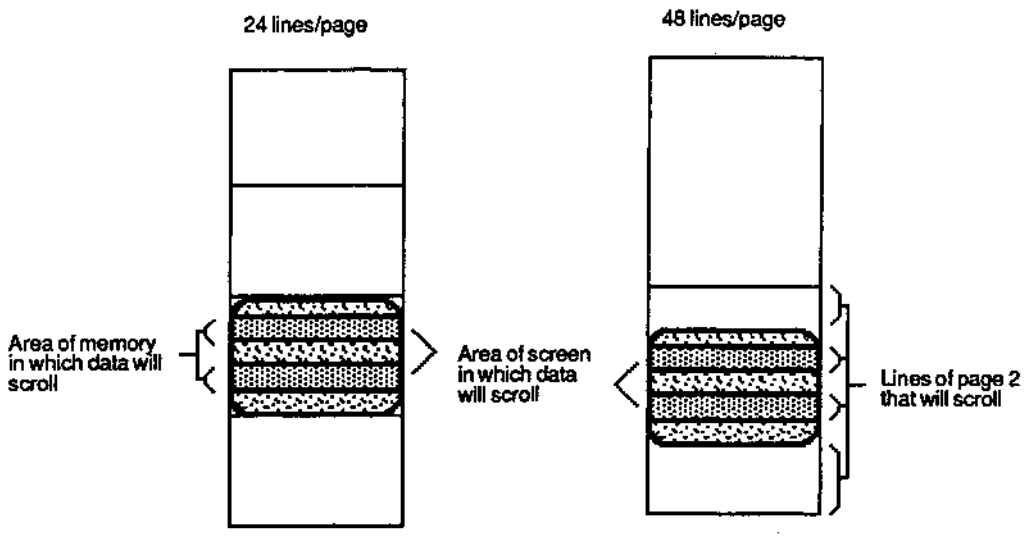


Figure 3-7. Locking Lines

Example:

Suppose that Lines/page is 24.

To lock rows 10, 15, 19, and 20,

move the cursor to row 10 and enter the sequence ESC ! 1
move the cursor to each of the other rows and enter the sequence

In this situation, lines 10, 15, 19, and 20 are locked, i.e., excluded from scrolling. Only the unlocked lines scroll. The first unlocked line of the page, in this case line 1, is identified on the Status Line as line 1, the second unlocked line as line 2, and so on. Line 10 on the Status Line is the data on line 11 in memory (the data on line 10 in memory is locked, and thus not counted here). Line 20, the last line of the scrolling area, is the data on line 24 in memory.

When all lines are unlocked again, data scrolls in the usual way.

NOTE

If lines per page is 48 or 96, scroll-order of the locked lines depends on which unlocked lines were on-screen when all lines were unlocked.

3.3.4 Flipping from Page to Page

Ordinarily, data exceeding the last line of a page is written on the same page -- regardless of whether scrolling is ON or OFF.

The terminal may be set so that data exceeding the last line of a page is written on the next page; i.e., so that the terminal "flips" to a new page to store the data (and the screen flips to a new page to display the data). See Figure 3-8.

NOTE: Data exceeding the last line of the last page flips to the first page.

To turn on page flipping,

> In Set-Up (Line 2), set FLIP ON or
> enter the sequence **ESC v**

To turn off page flipping,

> In Set-Up (Line 2), set FLIP OFF or
> enter the sequence **ESC w**

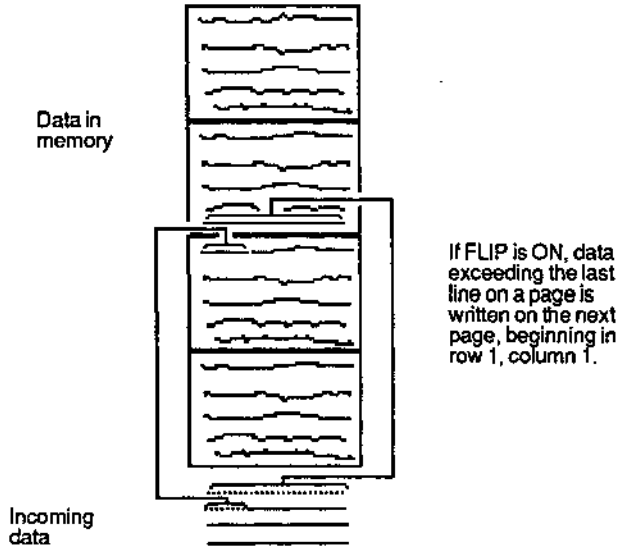


Figure 3-8. Flipping from Page to Page

3.4 ENTERING AND EDITING DATA

Text entered via the keyboard or received from a host can be edited on the *Ampex 230 plus* terminal in a variety of contexts. In some cases the effect of editing depends on whether or not write-protection is in effect (Section 3.4.1), whether characters you type are inserted or replace displayed characters (Section 3.4.3.1), and on page characteristics (Section 3.3). These differences will be noted when applicable.

3.4.1 Write-Protecting Data

Certain areas of the screen can be "write-protected". Write-protecting an area has basically two purposes:

Prevent data in the area from being edited
Prevent data in the area from being sent to the host.

For example, write-protecting may be used to create on-screen forms. Standard information on the form, such as headings (e.g., "Admission Form") and labels ("Name", "Address", etc.), is entered into write-protected areas.

To enter data which you want to "write-protect",

1. Move the cursor to the area to be protected.
2. Press **ESC)**. (This signals the beginning of a protected field.) "WPT" (Write Protect) will appear on the status line.
2. Enter the desired characters, numbers, and spaces.
3. Press **ESC (** . (This signals the end of the protected field.) WPT disappears from the status line.

To then protect such data from being edited (PRT will appear on the StatusLine),

enter the sequence **ESC &**.

To unprotect such data (so that it may be edited) (PRT will disappear from the status line),

enter the sequence **ESC '** (single quote).

Video Attributes of Protected Characters

Ordinarily, protected characters are displayed in half-intensity (dimmer than normal). Different video attributes for protected characters may be selected in Set-Up (Line 1).

PROT=H.I.	half-intensity
PROT=BOTH	half-intensity and reverse
PROT=NORM	normal
PROT=REV	reverse

3.4.2 Moving the Cursor

3.4.2.1 Cursor Keys

The cursor keys control the movement of the cursor. The effect of each key depends on how you have Set-Up the terminal (see Section II).

Table 3-4. Cursor Keys

Note: PROT ON means Protect (Text) mode is on (PRT displays on the Status Line).

Key	Code	If Setting is	Effect
ARROW KEYS			
DOWN	CTRL/V		Moves cursor down one line in same column. If cursor is on last line of page, cursor does not move.
SHIFT/DOWN	CTRL/J		{same as linefeed}
UP	CTRL/K		Moves cursor up one row in same column. If cursor is on line 1, cursor does not move.
SHIFT/UP	ESC j		Moves cursor up one row in same column.
		SCROLL ON	If cursor is on row 1, all lines of data move down one; cursor remains on row 1 in same column.
		SCROLL OFF or PROT ON	If cursor is one row 1, moves cursor to last line of page; all lines of data remain in place.
LEFT	CTRL/H		Moves cursor one column left. If cursor is in column 1, moves cursor to last column of preceding line.
		SCROLL OFF or PROT ON	If cursor is HOME, moves cursor to last column of last line of page.
		SCROLL ON	If cursor is HOME, cursor will not move.

Key	Code	If Setting is	Effect
RIGHT	CTRL/L		Moves cursor one column right.
		WRAP ON	If cursor is in last column of line, moves cursor to first column of next line.
		& SCROLL ON	If cursor is in last column of last line of page, all lines of data scroll up one and cursor moves to first column of last line of page.
		& SCROLL OFF or PROT ON	If cursor is in last column of last line of page, cursor moves to HOME, no scrolling occurs.
		WRAP OFF	If cursor is in last column of line, command ignored.
BACK SPACE	CTRL/H		Moves cursor one column left. If cursor is in column 1, moves cursor to last column of preceding line.
		SCROLL OFF or PROT ON	If cursor is HOME, moves cursor to last column of last line of page.
		SCROLL ON	If cursor is HOME, cursor will not move.
		PROT OFF	Moves cursor to previous tab stop or, if no previous tab stop on the line, to column 1.
BACK TAB	ESC I		
		PROT ON	
		& FLIP OFF	Moves cursor to start of the previous unprotected field on the current page. If none, moves cursor to start of following unprotected field on page. If none, cursor moves to the HOME position and resets Protect mode.
		& FLIP ON	Moves cursor to start of the previous unprotected field on the current page. If none, moves cursor to start of following unprotected field on the page. If none, moves cursor to start of first unprotected field on next page. If none, cursor moves to HOME position and resets Protect mode.

Table 3-4 (cont'd). Cursor Keys

Key	Code	If Setting is	Effect
HOME	CTRL/^	PROT OFF	Moves cursor to HOME position (row 1, column 1)
		PROT ON	Moves cursor to beginning of first unprotected field on the page.
LINEFEED	CTRL/J		Moves cursor down one line in same column.
		SCROLL ON	If cursor on last line of page, all lines of data move up one; cursor remains on last line of page in same column.
		SCROLL OFF	If cursor on last line of page, moves cursor to HOME; all lines of data remain (no scrolling).
PAGE	ESC K		Moves display to next page, cursor moves to its last position on page. If no previous position on page, cursor moves to HOME.
SHIFT/PAGE	ESC J		Moves display to previous page, cursor moves to its last position on page.
RETURN	CTRL/M	CR=CRLF	
		& PROT OFF	Moves cursor to first column of next line.
		& PROT ON	Moves cursor to first unprotected column of the next and following lines.
		& SCROLL ON	If cursor on last line of page, all lines of data move up one and cursor moves to beginning of last line.
		& SCROLL OFF	If cursor on last line of page, cursor moves to HOME, all lines of data remain in place (no scrolling).

Key	Code	If Setting is CR=CR	Effect
		& PROT OFF	Moves cursor to first column of the same line
		& PROT ON	Moves cursor to first unprotected column of the same line. If the line is protected, moves cursor to next unprotected column on the page.
TAB	CTRL/I	PROT OFF	Moves cursor to next tab stop; ignored if there is no next tab stop.
		PROT ON	
		& FLIP OFF	Moves cursor to the beginning of the next unprotected field on the current page. If there are no unprotected fields on the page, cursor moves to HOME position and resets Protect mode.
		& FLIP ON	Moves cursor to the beginning of the next unprotected field, if any. If none, cursor moves to HOME position and resets Protect mode.
[Field Tab]	ESC i	PROT OFF	Ignored
		PROT ON	
		& FLIP OFF	Moves cursor to the beginning of the next unprotected field on the current page. If there are no unprotected fields on the page, cursor moves to HOME position and resets Protect mode.
		& FLIP ON	Moves cursor to the beginning of the next unprotected field, if any. If none, cursor moves to HOME position and resets Protect mode.

3.4.2.2 Moving the Cursor Using an Escape Sequence

An escape sequence can also be used to move the cursor (known as "addressing" the cursor) to any location on the current page or to another page.

Moving on the Current Page

Either of two methods may be used to move the cursor on the current page. One method uses an ASCII conversion of the (decimal) number of the row or column; the other uses the number itself.

Using an ASCII Conversion (Not recommended if line length is 132 columns)

To position the cursor to a new row and column, enter the sequence

For columns 1 to 80	For columns 81 to 132
ESC = r c	**ESC** = r **CTRL/_** c

where r denotes the desired row (in ASCII) (see Appendix G)
c denotes the desired column (in ASCII) (see Appendix G)

For example,

ESC = (CTRL/_ 3

positions the cursor in row 9, column 100.

Using the Decimal Number

To position the cursor regardless of whether line width is 80 or 132 columns, enter the sequence

ESC .9 rr R ccc C

where rr denotes the number of the desired row (HOME = 01)
ccc denotes the number of the desired column (HOME = 01)

Note: this sequence cannot be used to move the cursor to another page.

FOR EXAMPLE

ESC .9 1 R 1 C

moves the cursor to the HOME position.

ESC .9 48 R 71 C

moves the cursor to row 48, column 71 (only if page length is 48 or 96 lines).

Moving to Another Page

An escape sequence can also be used to move the cursor to another page. Two methods are available: for moving the cursor to an adjacent page, for moving it to a particular location on any other page.

Moving to an Adjacent Page

To move the cursor to the next page, enter the sequence

ESC K

The cursor moves to its last position, if any, or to the HOME position on the next page.

To move the cursor to the previous page, enter the sequence

ESC J

The cursor moves to its last position on the previous page.

Moving to Any Other Page

To position the cursor to a particular location on any other page, enter the sequence

For columns 1 to 80	For columns 81 to 132
ESC - p r c	**ESC** - p r **CTRL/_** c

where p denotes the desired page (0 = page one, 1 = page two, etc.)
r denotes the desired row (in ASCII) (see Table G)
c denotes the desired column (in ASCII) (see Table G)

FOR EXAMPLE,

ESC - 1 . 3

positions the cursor on page two, row 15, column 20.

3.4.2.3 Locating the Cursor with an Escape Sequence

An escape sequence may also be used to locate ("read") the cursor.

To read the current row and column of the cursor,

1. Enter the sequence **ESC ?**

To read the current page, row, and column of the cursor,

1. Enter the sequence **ESC /**

3.4.2.4 Entering Data at the Hidden Cursor

Data may be entered even if the cursor is hidden, i.e., even if the cursor is not on the displayed page.

To enter data to a hidden cursor, enter the sequence

ESC . D p r c text **CTRL/Y**

where
- p denotes the page (0 = page 1, 1 = page 2, etc.)
- r denotes the row (in ASCII)(see Appendix G)
- c* denotes the column (in ASCII) (see Appendix G)
- text represents the text entered at the cursor
- CTRL/Y denotes the end of the text entered.

* Enter "c" for a column between 1 and 80; enter "CTRL/_ c" for a column between 81 and 132.

3.4.3 Editing Data

3.4.3.1 Defining the Editing Mode

The "Editing Mode" determines the effect of data entered from the keyboard and the range of characters affected by editing. The Editing Mode may be set in Set-Up or by using an escape sequence.

Entering data from the keyboard can be done in one of two ways:

Replacing (overwriting) characters, beginning at the cursor
Inserting characters, beginning at the cursor

The range affected by inserting or deleting characters may be

line (from the cursor to the end* of the line)
page (from the cursor to the end* of the page)

* Data exceeding the end is lost.

The combination of these two factors then defines four editing modes:

	Editing Modes Range	
	Line	Page
Effect of Typing		
Replace	Edit Line (EDTL**)	Edit Page (EDTP)
Insert	Insert Line (INSL)	Insert Page (INSP)

** Message on Status Line.

To set the editing mode in Set-Up (Line 1),

For	choose
Edit Line	EDTL
Edit Page	EDTP
Insert Line	INSL
Insert Page	INSP

To set the Editing mode using Escape Sequences, set the effect of typing and the range independently.

To set the effect of typing,

For	Enter sequence	Or press
Insert	ESC q	CTRL/CHAR INSERT
Replace	ESC r	CTRL/CHAR DELETE

To set the range,

For	Enter sequence	Or press
Page	ESC N	CTRL/LINE INSERT
Line	ESC O	CTRL/LINE DELETE

3.4.3.2 Edit Keys

The Editing keys are used to make changes to data displayed on the screen. The effect of each key depends on how the terminal is set up (see Section II). The effect of each key is shown in Table 3-5.

Table 3-5. Edit Keys

Note: PROT ON means Protect (Text) mode is on (PRT displays on the Status Line).

Key	Code	If Setting is	Effect
CHAR DELETE	ESC W	PROT OFF	Deletes character at the cursor position, moves all following characters one column left. Insert-Characters fill ending columns vacated by moving characters.
		PROT ON	Deletes character at the cursor position, moves all following unprotected characters in the field one column left (character in last unprotected column is replaced by an Insert-Character).
CHAR INSERT	ESC Q	PROT OFF	Enters an Insert-Character at the cursor position, moves all following characters one column right (character in last column of range is lost).
		PROT ON	Enters an Insert-Character at the cursor position, moves all following unprotected characters in the field one column right (character in last unprotected column is lost).
ERASE LINE	ESC T	PROT OFF	Erases all characters from cursor position to end of line. Insert-Characters replace erased characters.
		PROT ON	Erases all unprotected characters from cursor position to end of line. Insert-Characters replace erased characters.
ERASE PAGE	ESC Y	PROT OFF	Erases all characters from cursor position to end of page. Insert-Characters replace erased characters.
		PROT ON	Erases all unprotected characters from cursor position to end of page. Insert-Characters replace erased characters.

Note also: The default Insert-Character is space. To change the Insert-Character to some other character, enter the sequence

ESC e x

where x denotes the desired (alphabet or numeric) Insert-Character.

Key	Code	If Setting is	Effect
CTRL/ERASE LINE	ESC t	PROT OFF	Erases all characters from cursor position to end of line. Null characters replace erased characters.
		PROT ON	Erases all unprotected characters from cursor position to end of line. Null characters replace erased characters.
CTRL/ERASE PAGE	ESC y	PROT OFF	Erases all characters from cursor position to end of page. Null characters replace erased characters.
		PROT ON	Erases all unprotected characters from cursor position to end of page. Null characters replace erased characters.
LINE DELETE	ESC R	PROT OFF	Deletes data in the line on which cursor is positioned. Remaining data moves up one line; Insert-Characters replace the last line. Cursor moves to column 1 on same line.
		PROT ON	Command ignored.
LINE INSERT	ESC E	PROT OFF	Beginning with line on which cursor is located, moves data down one line; Insert-Characters fill the line on which cursor is positioned (data on last line is lost); moves cursor to column 1 of line.
		PROT ON	Command ignored.

3.5 CLEARING DATA

There are several ways to clear data from the screen and/or host's memory. Table 3-6 lists different ways to clear data.

Note: The default Insert-Character is space. To change the Insert-Character to some other character, enter the sequence

ESC e x

where x denotes the desired (alphabet or numeric) character

NOTE

If Protect (Text) mode is OFF, CLEAR-unprotected commands work like CLEAR-all commands: they clear all characters.

NOTE also

If Write-Protect (Text) mode is OFF, CLEAR-unprotected commands clear with full intensity Insert-Characters. If Write-Protect (Text) mode is ON, CLEAR-unprotected commands clear with protected-text video-attribute (Set-Up, Line 1) Insert-Characters.

Table 3-6. Clear Commands

Command	Code	Key	Effect
Clear Unprotected to Nulls	ESC :	---	Clears all unprotected data on the page to null characters.
Clear All to Nulls	ESC *	CTRL/CLEAR	Clears all data on the page to null characters, resets Protect Mode and Write-Protect Mode to OFF.
Clear Unprotected to Half Intensity Insert-Character	ESC ,	---	Clears all unprotected data on the page with half-intensity Insert-Character.
Clear Unprotected to Insert-Character	CTRL/Z ESC + *or* ESC ;	CLEAR	Clears all unprotected data on the page with Insert-Character.
Clear Field to Spaces (Clear Entry)	CTRL/X	CE	If PROT OFF, erases all characters between the previous tab stop and next tab stop and movers cursor to previous tab stop. If no previous tab stop, erases from column 1. If no next tab stop, erases to end of line. If no tab stops, erases entire line. If PROT ON, erases all characters in the field of unprotected data in which the cursor is located.

3.6 ENTERING FUNCTION COMMANDS

A function command is used to execute an action without having to repeatedly enter the same series of keystrokes. There are two ways to enter function commands on the *Ampex 230 plus*, pressing the FUNCT key in conjunction with another key or pressing one of the function keys.

3.6.1 Using the FUNCT key

To enter a command using the FUNCT key, simultaneously press the FUNCT key and the desired second key.

Pressing the two-keys transmits a three-character sequence: SOH (start of header), the ASCII character of the second key, and a CR (carriage return).

For example,

pressing	sends the function-code sequence
FUNCT/A	SOH A CR

3.6.2 Using the Function Keys

Pressing a function key or pressing SHIFT/function-key transmits a three-character sequence: SOH (start of header) = CTRL/A, the ASCII character associated with the function key, and a CR (carriage return). The ASCII character transmitted by each function key is given in Table 3-7.

Table 3-7. Function Key Sequences

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

3.6.2.1 Programming the Function Keys

You may change the sequence transmitted by pressing a function key. "PGK" appears on the Status Line during programming.

To program a function key, enter the sequence

ESC | p1 p2 message **CTRL/Y**

where p1 denotes the function key to be programmed (Table 3-8),
p2 denotes where the code will be transmitted (Table 3-9),
message denotes the desired function, and
CTRL/Y is the mandatory termination character.

Table 3-8. Values of p1 for *Ampex 230 plus* Fn Keys

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

Table 3-9. Values of p2 for *Ampex 230 plus* Fn Keys

If p2 is	New function code sent to
1	computer (full duplex)
2	screen only (local)
3	computer and screen (half duplex)

The "message" is the desired function: a string of ASCII characters, control codes, and escape sequences. Total memory available for storing new function key codes is 6K bytes. If desired, all storage may be devoted to reprogramming one function key. Be careful when programming: if you make a mistake while typing, you will need to start over.

Note also: If "CTRL/Y" is to be part of the message, enter the "Bypass Code"

CTRL/P

immediately before the CTRL/Y. The Bypass code denotes that the following code is to be part of the message. As you might expect, you include the Bypass Code itself in the message in the same way: CTRL/P CTRL/P

For example,

```
ESC | p1 p2        message                    CTRL/Y
ESC | 1  1   TURN ON PRINTER CR               CTRL/Y
```

programs F1 to send the message "TURN ON PRINTER" to the host.

3.6.3 Executing a Function Key from the Host

The action of a function key may also be initiated by the host.

To execute a function key from the host, send to the terminal the sequence

ESC . A p1

where p1 denotes the function key to execute (see Table 3-8)

3.7 SENDING

Data entered while the terminal is in BLOCK mode is not transmitted to the host until you SEND it. (NOTE: If the terminal is not in BLOCK mode and you try to SEND, only the particular escape sequence is sent.)

There are nine commands which can be used to transmit data from the terminal to the host. Table 3-10 indicates the code used to initiate transmission and if the SEND key can be used to initiate transmission. Table 3-11 describes the effect of each command if the terminal is set to Protect (Text) mode (PRT on Status Line).

NOTE: When attempting to send only unprotected characters, make sure that Protect Mode is on: It's ON if "PRT" appears on the Status Line.

NOTE

If the terminal is set to PROT OFF, SEND-unprotected commands work like SEND-all commands: they transmit all characters (in particular, no start or end of unprotected field codes are sent).

Table 3-10. SEND Command Codes

Command	Code	SEND key?
Send Line Unprotected	ESC 4	-
Send Page Unprotected	ESC 5	-
Send Line All	ESC 6	SHIFT/SEND
Send Page All	ESC 7	SEND
Send Unprotected Message	ESC S	-
Send Message All	ESC s	-
Send User Line	ESC Z0	-
Send Status Line	ESC Z1	-
Send Terminal ID	ESC M	-

Table 3-11. Effect of SEND Commands

Command	Effect
Send Line Unprotected	Transmits all unprotected characters on a line, from column 1 through cursor position. [Cursor must be on the line to be transmitted.] ASCII code FS (1C hex) is sent in place of each protected field and an end-of-message character is sent at the end of transmission.
Send Page Unprotected	Transmits all unprotected characters on page, from HOME through cursor position. ASCII code FS (1C hex) is sent in place of each protected field, an end-of-line character is sent at the end of each line, and an end-of-message character is sent at the end of transmission.
Send Line All	Transmits all characters (and their video attributes) on a line, from column 1 through cursor position. [Cursor must be on the line to be transmitted.] ESC) is sent to denote the beginning of each protected field, ESC (is sent to denote the end of each protected field, and an end-of-message character is sent at the end of transmission.
Send Page All	Transmits all characters (and their video attributes) on page, from HOME through cursor position. ESC) is sent to denote the beginning of each protected field, ESC (is sent to denote the end of each protected field, an end-of-line character is sent at the end of each line, and an end-of-message character is sent at the end of transmission.
Send Unprotected Message	Transmits all unprotected data denoted by start-of-text (STX) and end-of-text (ETX) code(s). If there is no STX code, transmission begins at the HOME position. If there is no ETX code, transmission concludes at the END of the page. FS codes (1C hex) is sent in place of each protected field, an end-of-line character is sent at the end of each line, and an end-of-message character is sent at the end of transmission.
Send Message All	Transmits all data denoted by start-of-text (STX) and end-of-text (ETX) code(s). If there is no STX code, transmission begins at the HOME position. If there is no ETX code, transmission concludes at the END position. ESC) is sent to denote the beginning of each protected field, ESC (is sent to denote the end of each protected field, an end-of-line character is sent at the end of each line, and an end-of-message character is sent at the end of transmission.
Send User Line	Transmits the contents of the user line to the computer.
Send Status Line	Transmits the contents of the status line to the computer.
Send Terminal ID	Transmits the ANSWERBACK message (see Set-Up, Line 7). Default message is software level, number of pages in memory (1=1 pg, 2=2 pg, or 3=4 pg), and a carriage return.

3.7.1 Programming Delimiters

Depending upon the particular SEND command, the terminal transmits a delimiter to signify the

existence of a protected field,
end of each line,
start of each protected field,
end of each protected field, and
end of the message.

The default values for each of these are given in Table 3-12.

Table 3-12. Default Delimiter Values for SEND

Delimiter	p1	p2
Existence of a protected field	FS	null
End of line	US	null
Start of protected field	ESC	)
End of protected field	ESC	(
End of the message	CR	null

To change a delimiter (It must match the delimiter used by the host), enter the sequence

ESC **x** n p1 p2

where n is the code for the delimiter being programmed:

Code	Delimiter
0	protected field
1	end of line
2	start of protected field
3	end of protected field
4	end of message

p1 is any ASCII character or control code*
p2 is any ASCII character or control code*

* If no delimiter is needed, enter p1 and p2 as nulls.

3.7.2 Programming the SEND Key

You can change the effect of pressing SEND or SHIFT/SEND.

To program the SEND key, enter the sequence

ESC 0 x y

where x denotes the SEND key to be programmed (1=SEND, 2=SHIFT/SEND),
y denotes the code to be transmitted (see Table 3-13).

Table 3-13. Programming the SEND Key

y	Sequence	Effect
4	ESC 4	Send Line Unprotected
5	ESC 5	Send Page Unprotected
6	ESC 6	Send Line All
7	ESC 7	Send Page All
S	ESC S	Send Message Unprotected
s	ESC s	Send Message All

FOR EXAMPLE,

ESC 0 1 7

programs the SEND key to Send Page All.

3.8 PRINTING

Data may be printed by sending it (via the auxiliary port) to a printer attached to the terminal. During printing, a message appears on the Status Line to indicate the print command used. The printer can communicate with the host if the terminal's printer (auxiliary) port is set for "bidirectional printing". In Set-Up (Line 5), choose BIDIR ON. Data may be sent through the printer port in any of several ways (see Table 3-14), using either an escape code or, if appropriate, the PRINT key.

Table 3-14. PRINT Commands

Command	Start	Stop	Status Line
Page Print (formatted)	ESC P or PRINT	-	PTG
Page Print (unformatted)	ESC L or SHIFT/PRINT	-	UFP
Transparent Print	ESC `	ESC a	TPR
Copy Print	ESC @	ESC A	CPP
Bidirectional	CTRL/R	CTRL/T	BDIR

Table 3-15. Effect of PRINT Commands

Command	Effect
Page Print (formatted)	Transmits data from HOME through cursor position. Prints data as entered, including line delimiters at the end of each line (carriage return and linefeed) and end of printing. At the end of printing, ACKnowledge code (06 Hex) sent to the host; cursor positioned on the next page.
Page Print (unformatted)	Transmits data from HOME through cursor position. Prints data as entered, but without delimiters at the end of each line and end of printing. At the end of printing, ACKnowledge code (06 Hex) sent to the host; cursor positioned on the next page.
Transparent Print	Following **ESC '**, terminal transmits all data received from the host, including escape sequences and control codes, directly to the printer without acting upon the data or displaying it on the screen. Data is sent first to terminal's buffer before going to printer. If terminal's buffer is in danger of overflowing, terminal transmits an XOFF or a drop DTR, signalling the host to stop sending. When the buffer is again able to receive, the terminal sends an XON or raise DTR, signalling the host to resume.
Extension (Copy) Print	Following **ESC @**, terminal transmits all data received from the host, including escape sequences and control codes, both to the printer and to the screen.
Bidirectional	Following CTRL/R, printer can transmit data to host.

3.9 PROGRAMMING THE EDITING KEYS

You may change the effect of pressing an editing, cursor-moving, or control key by redefining the code transmitted when the key is pressed. The new code may be one normally sent by one of the other editing, cursor-moving, or control keys or may be one used by a particular application.

To program an editing key, enter the sequence

ESC 0 m a b c

where m denotes the key to be programmed* (see Table 3-16, Table 3-17)
a,b,c the hex codes for the desired effect. NOTE: if a sequence is less than three keys long, "b" and/or "c" are "null".

Default values for the keys are given in Tables 3-16 and 3-17.

NOTE

To return all editing keys to their default values, enter Set-Up and press SHIFT/D

FOR EXAMPLE

to program the DOWN arrow key to "cursor down" in WordStar™, enter the sequence

ESC 0 A CTRL/X NUL NUL

To program the SHIFT/PAGE key to use 132 column display, enter the sequence

ESC 0 o ESC 6

Table 3-16. Default Codes and Effects for Editing Key

Key	m	Effect	Hex a	Hex b	Hex c	ASCII d	ASCII e	ASCII f
HOME*	@	Cursor Home	1E	00	00	RS	NUL	NUL
DOWN arrow	A	Cursor down	16	00	00	SYN	NUL	NUL
UP arrow	B	Cursor up	0B	00	00	VT	NUL	NUL
LEFT arrow	C	Cursor left	08	00	00	BS	NUL	NUL
RIGHT arrow	D	Cursor right	0C	00	00	FF	NUL	NUL
TAB	E	Go to next tab	09	00	00	HT	NUL	NUL
BACK TAB	F	Go to previous tab	1B	49	00	ESC	I	NUL
CLEAR*	G	Clear unprot. to spaces	1A	00	00	SUB	NUL	NUL
PRINT	H	Print page	1B	50	00	ESC	P	NUL
CHAR INSERT*	I	Insert character	1B	51	00	ESC	Q	NUL
CHAR DELETE*	J	Delete character	1B	57	00	ESC	W	NUL
LINE INSERT*	K	Insert line	1B	45	00	ESC	E	NUL
LINE DELETE*	L	Delete line	1B	52	00	ESC	R	NUL
LINE ERASE*	M	Erase line with spaces	1B	54	00	ESC	T	NUL
PAGE ERASE*	N	Erase page with spaces	1B	59	00	ESC	Y	NUL
PAGE	O	Go to next page	1B	4B	00	ESC	K	NUL
SEND	P	Send page all	1B	37	00	ESC	7	NUL
TAB (num pad)	Q	Go to next tab	09	00	00	HT	NUL	NUL
CE	R	Clear entry	18	00	00	CAN	NUL	NUL
ENTER	S	Carriage return	0D	00	00	CR	NUL	NUL

*Because CLEAR = SHIFT/HOME, CHAR DELETE = SHIFT/CHAR INSERT, LINE DELETE = SHIFT/LINE INSERT, and ERASE PAGE = SHIFT/ERASE LINE, the marked entries in the Tables 3-16 and 3-17 should be understood as indicated below. In particular, note that, for example, SHIFT/PAGE ERASE in Table 3-17 should be understood as the key sequence CTRL/SHIFT/LINE ERASE.

KEY	m
HOME	@
CLEAR (SHIFT/HOME)	G
CHAR INSERT	I
CHAR DELETE (SHIFT/CHAR INSERT)	J
LINE INSERT	K
LINE DELETE (SHIFT/LINE INSERT)	L
LINE ERASE	M
PAGE ERASE(SHIFT/LINE ERASE)	N

CTRL/KEY	m
HOME	
CLEAR (SHIFT/HOME)	g
CHAR INSERT	i
CHAR DELETE (SHIFT/CHAR INSERT)	j
LINE INSERT	k
LINE DELETE (SHIFT/LINE INSERT)	l
LINE ERASE	m
PAGE ERASE (SHIFT/LINE ERASE)	n

Table 3-17. Default Codes and Effects for SHIFT/Editing-Key

			Hex			ASCII		
Key	m	Effect	a	b	c	d	e	f
HOME*	`	Cursor Home	1E	00	00	RS	NUL	NUL
DOWN arrow	a	Line feed	0A	00	00	LF	NUL	NUL
UP arrow	b	Reverse Line feed	1B	6A	00	ESC	j	NUL
LEFT arrow	c	Cursor left	08	00	00	BS	NUL	NUL
RIGHT arrow	d	Cursor right	0C	00	00	FF	NUL	NUL
TAB	e	Go to next tab	09	00	00	HT	NUL	NUL
BACK TAB	f	Go to previous tab	1B	49	00	ESC	I	NUL
CLEAR*	g	Clear all to nulls	1B	2A	00	ESC	*	NUL
PRINT	h	Print unformatted	1B	4C	00	ESC	L	NUL
CHAR INSERT*	i	Insert character	1B	51	00	ESC	Q	NUL
CHAR DELETE*	j	Delete character	1B	57	00	ESC	W	NUL
LINE INSERT*	k	Insert line	1B	45	00	ESC	E	NUL
LINE DELETE*	l	Delete line	1B	52	00	ESC	R	NUL
LINE ERASE*	m	Erase line with nulls	1B	74	00	ESC	t	NUL
PAGE ERASE*	n	Erase page with nulls	1B	79	00	ESC	y	NUL
PAGE	o	Go to previous page	1B	4A	00	ESC	J	NUL
SEND	p	Send line all	1B	36	00	ESC	6	NUL
TAB (num pad)	q	Go to next tab	09	00	00	HT	NUL	NUL
CE	r	Clear entry	18	00	00	CAN	NUL	NUL
ENTER	s	Carriage return	0D	00	00	CR	NUL	NUL

To program all keys, enter the sequence

ESC] n <codes>

where n denotes the keys to be programmed (0 = key, 1 = SHIFT/Key)

<codes> denotes the ASCII codes (columns d, e, and f of Tables 3-16 and 3-17) for the desired effect for each key, entered in the order given in Tables 3-16 and 3-17 (Note: Codes for all 20 keys must be entered, for a total of 60 bytes):

d e f (HOME)
d e f (DOWN Arrow)
d e f (UP Arrow)
. . . .
. . . .
. . . .
d e f (ENTER)

FOR EXAMPLE, to reverse the effect of the SHIFT/LEFT and SHIFT/RIGHT arrow keys

1. To initiate programming for all SHIFT/Keys, enter

   ESC] 1

2. Then enter without spaces

d	e	f	SHIFT/KEY
RS	NUL	NUL	(HOME)
LF	NUL	NUL	(DOWN)
ESC	j	NUL	(UP)
FF	NUL	NUL	(LEFT)
BS	NUL	NUL	(RIGHT)

3. Continue entering values for the remaining keys in the same way, in the order given in Table 3-17

3.10 SETTING THE TIME

The time of day may be set in one of two ways, by going into Set-Up (Line 3) or by entering the following sequence

ESC .C1 N HH MM

where	N	= meridiem	A = AM, P = PM
	HH	= hour,	two digits: 01 to 12
	MM	= minutes	two digits: 00 to 59

NOTE: Time will display in 24 hour form: 1:15 PM is displayed as 13-15.

3.10.1 Host Request for Time-of-Day

The host may request the time-of-day by sending to the terminal the sequence

ESC . C 2

The terminal responds

N HH MM CR

where N, HH, and MM are the meridiem, hour, and minutes, as above.

SECTION IV
EMULATING OTHER TERMINALS

INTRODUCTION

The *Ampex 230 plus* terminal can emulate a number of terminals made by other manufacturers. That is, it mimics the operating characteristcs of that terminal, especially by using the same command sequences.

To choose a particular emulation,

1. Press SET-UP (SHIFT/NO SCROLL)
2. Move the cursor to third box of Set-Up Line 1.
3. Scroll the choices until the desired emulation appears.
4. Press SHIFT/S to save the choice.

This section explains important features of operating the *Ampex 230 plus* while emulating another terminal. The section is divided by the emulated terminals' manufacturers.

Escape sequences and control codes for each emulation are given in Appendix D.

Manufacturer	Terminal Emulated	Setting
ADDS	Viewpoint A1	VP-A1
	Viewpoint A2	VP-A2
Ampex	210	A210
Hazeltine	1500	H1500
TeleVideo	910	TV910
	920/912	TV920
	924/914	TV924
	925	TV925
	950	TV950
Wyse	WY-50	WY50

NOTE: In those emulations where functions keys may be reprogrammed, function key contents are stored in nonvolatile memory and will be in effect if the terminal is turned off and then on. However, changing the emulation returns all function key sequences to their default values.

4.1 ENHANCED EMULATION

The *Ampex 230 plus* offers enhanced operation in ALL emulations. Enhanced operation means the emulation has features available in the native mode: programmable function and editing keys, 132 column line length, and graphics character capability.

To operate in enhanced emulation, in Set-Up (Line 3),

choose ENHANCE ON

Column width is changed in Set-Up (Line 1); graphics characters are turned on and off in Set-Up (Line 2).

NOTE: Vis a vis normal emulation, enhanced emulation has the important effect of adding features otherwise unavailable in an emulation. But a feature may be available in normal emulation (see Table 4-1). In this situation, the capability is unchanged by enhanced emulation.

Table 4-1. Normal versus Enhanced Emulation

	Graphics?		Program Function Keys?	
Emulation	Normal	Enhanced	Normal	Enhanced
VP-A1	No	like WY-50	No	Yes
VP-A2	No	like WY-50	No	Yes
A210	Line	Line	No	Yes
H1500	No	Line, Block	No	Yes
TV910	No	Line, Block	No	Yes
TV920	No	Line, Block	No	Yes
TV924	Special	Special	Yes*	Yes
TV925	No	Line, Block	No	Yes
TV950	Line	Line	Yes	Yes
WY-50	Special	Special	Yes	Yes

* Editing keys may also be programmed during normal emulation of the TeleVideo 924.

Function Keys

Note further: there are 32 function keys available (16 Fn, 16 SHIFT/Fn) in each emulation. Codes for the Viewpoint emulations are given in Section 4.2. Codes for all other emulations are described below:

Pressing a function key transmits a three-character sequence:

Lead-in Code	ASCII Code	Terminator Code
SOH	m	CR

where "m" is the value associated with the function key. The value of "m" for each key is given in Table 4-2.

Table 4-2. Function Key ASCII Code Values

Function Key	If Fn. m is	If SHIFT/Fn. m is
F1	@	'
F2	A	a
F3	B	b
F4	C	c
F5	D	d
F6	E	e
F7	F	f
F8	G	g
F9	H	h
F10	I	i
F11	J	j
F12	K	k
F13	L	l
F14	M	m
F15	N	n
F16	O	o

Note finally, the capability to program function or editing keys is available in certain normal emulations. The procedure for programming function keys in normal emulation is given below in the section discussing the emulation. The procedure for programming function and command keys in enhanced emulation is given in Section III.

4.2 ADDS

4.2.1 Viewpoint A1 and A2

Function Keys

Pressing a function key transmits a two-character sequence:

Lead-in Code	ASCII Code
STX	m

where "m" is the value associated with the function key. The value of "m" for each key is given in Table 4-3.

Table 4-3. Viewpoint Function Key Codes

Function Key	STX ...	If SHIFT/Fn, STX ...
F1	1	!
F2	2	"
F3	3	#
F4	4	$
F5	5	%
F6	6	&
F7	7	'
F8	8	(
F9	9	)
F10	:	*
F11	;	+
F12	<	,
F13	=	-
F14	>	.
F15	?	/
F16	@	0

4.3 Ampex

4.3.1 210

Function Commands

In this emulation, a function command may be transmitted by pressing FUNCT/another-key. The sequence transmitted is

SOH (CTRL/A) ASCII code of key CR

Function commands may also be transmitted by pressing a function key. See Table 4-2 for a list of codes transmitted.

Video Attributes

In this emulation, video attributes of characters may include

blank (invisible)
flash
reverse
underline

and combinations thereof, e.g.,

flash reverse
flash reverse underline

A video attribute or combination thereof is denoted by a three-character escape sequence:

ESC G n

where "n" is the value associated with the attribute or combination. The value of "n" associated with an attribute is given in Table 4-7.

Clearing Data

There are several ways to clear data from the screen and/or host's memory. Table 4-8 lists different ways to clear data in this emulation -- under the column, TV925.

Setting the Time

The time of day may be set by entering the sequence

ESC space 1 N HH MM

where N = meridiem, A=AM, P=PM
HH =hour, two digits: 01 to 12
MM =minutes two digits: 00 to 59

For example, to set the time to 1:15 PM, enter

ESC space 1 P 01 15

Remember, 1:15 PM is displayed as 13-45.

Host Request Time-of-Day

The host may request the time-of-day by sending to the terminal the sequence

ESC space 2

The terminal responds

N HH MM CR (carriage return)

Special Graphics

Figure 4-1 lists the graphics symbols available in this emulation and the keys used to generate each symbol.

To turn on the graphics characters, enter the sequence **ESC $**

To turn off the graphics characters, enter the sequence **ESC %**

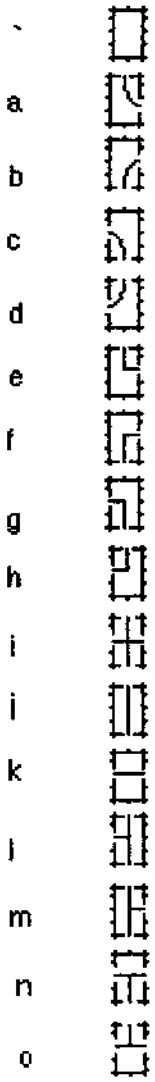


Figure 4-1. Ampex 210 Graphics

4.4 HAZELTINE

Note: the lead-in code for command sequences depends on the choice made in Set-Up (Line 3):

LEAD-IN = ~ (tilde) or
LEAD-IN =ESC

Although Appendix D indicates sequences with each value, it should be understood: either one or the other lead-in code applies to all sequences.

4.4.1 1500

When using one of the optional national character sets in conjunction with a leading tilde, the tilde is replaced with the appropriate national character or symbol (see Appendix B).

4.5 TELEVIDEO

4.5.1 910

FUNCT/Numeric Key

In this emulation, a function command may be transmitted by pressing FUNCT/another-key. The sequence transmitted is

SOH (CTRL/A) ASCII code of key CR

Function commands may also be transmitted by pressing a function key (Fn) or SHIFT/Fn. See Table 4-2 for a list of codes transmitted.

Video Attributes

A video attribute or combination thereof is denoted by a three-character escape sequence:

ESC G n

where "n" is the value associated with the attribute or combination. The value of "n" associated with an attribute is given in Table 4-7.

Clearing Data

There are several ways to clear data from the screen and/or host's memory. Table 4-8 lists different ways to clear data in this emulation.

4.5.2 920

Function Keys

Function commands may also be transmitted by pressing a function key (Fn) or SHIFT/Fn. See Table 4-2 for a list of codes transmitted.

Video Attributes

Video attributes for this emulation are given in Table 4-4.

Table 4-4. Video Attributes for TV920

Attribute	Sequence
Start blank	ESC _
Start blink	ESC ^
End blink/blank	ESC q
Start Reverse Video	ESC j
End Reverse Video	ESC k
Start Underline	ESC l
End Underline	ESC m

4.5.3 924/914

Function Keys

Function commands may also be transmitted by pressing a function key (Fn) or SHIFT/Fn. See Table 4-2 for a list of codes transmitted.

Programming the Function Keys

You can change the sequence transmitted by a function key in normal emulation.

To program a function key, enter the sequence

ESC p1 p2 message **CTRL/Y**

where
- p1 denotes the function key to be programmed (Table 4-5),
- p2 denotes where the code will be transmitted (Table 4-6),
- message denotes the desired function, and
- CTRL/Y is the mandatory termination character.

Table 4-5. Values of p1 for TV924 Fn Keys

Function Key	For Fn, p1 is	For SHIFT/Fn, p1 is
F1	1	A
F2	2	B
F3	3	C
F4	4	D
F5	5	E
F6	6	F
F7	7	G
F8	8	H
F9	9	I
F10	:	J
F11	;	K
F12	<	L
F13	=	M
F14	>	N
F15	?	O
F16	@	P

Table 4-6. Values of p2 for TV924 Fn Keys

If p2 is	New function code sent to
1	computer (full duplex)
2	screen only (local)
3	computer and screen (half duplex)

The "message" is the desired function: a string of ASCII characters, control codes, and escape sequences. Total memory available for storing new function key codes is 6K bytes. If desired, all storage may be devoted to reprogramming one function key. Be careful when programming: if you make a mistake while typing, you will need to start over.

Note: If "CTRL/Y" is to be part of the message, enter the Bypass Code

CTRL/P

immediately before the CTRL/Y. The Bypass Code denotes that the following code is to be part of the message. As you might expect, you include the Bypass Code itself in the the message in the same way: CTRL/P CTRL/P

FOR EXAMPLE,

ESC p1 p2	message	CTRL/Y
ESC 1 1	TURN ON PRINTER CR	CTRL/Y

programs F1 to send the message "TURN ON PRINTER" to the host.

Video Attributes

In this emulation, video attributes may be displayed singly or in combination, and in half-intensity. Note: Write-protected text is displayed in full-intensity normal, not in half-intensity normal.

A video attribute or combination thereof is denoted by a three-character escape sequence:

ESC G n

where "n" is the value associated with the attribute or combination. The value of "n" associated with full-intensity attribute is given in Table 4-7. Values for half-intensity attributes are given in Appendix D.

Special Graphics

Figure 4-2 lists the graphics symbols available in this emulation and the key used to generate each symbol.

To turn on the graphics characters,
in Set-Up, choose GRAPH ON, or
enter the sequence **ESC $**

To turn off the graphics characters,
in Set-Up, choose GRAPH OFF, or
enter the sequence **ESC %**

Clearing Data

There are several ways to clear data from the screen and/or host's memory. Table 4-8 lists different ways to clear data in this emulation.

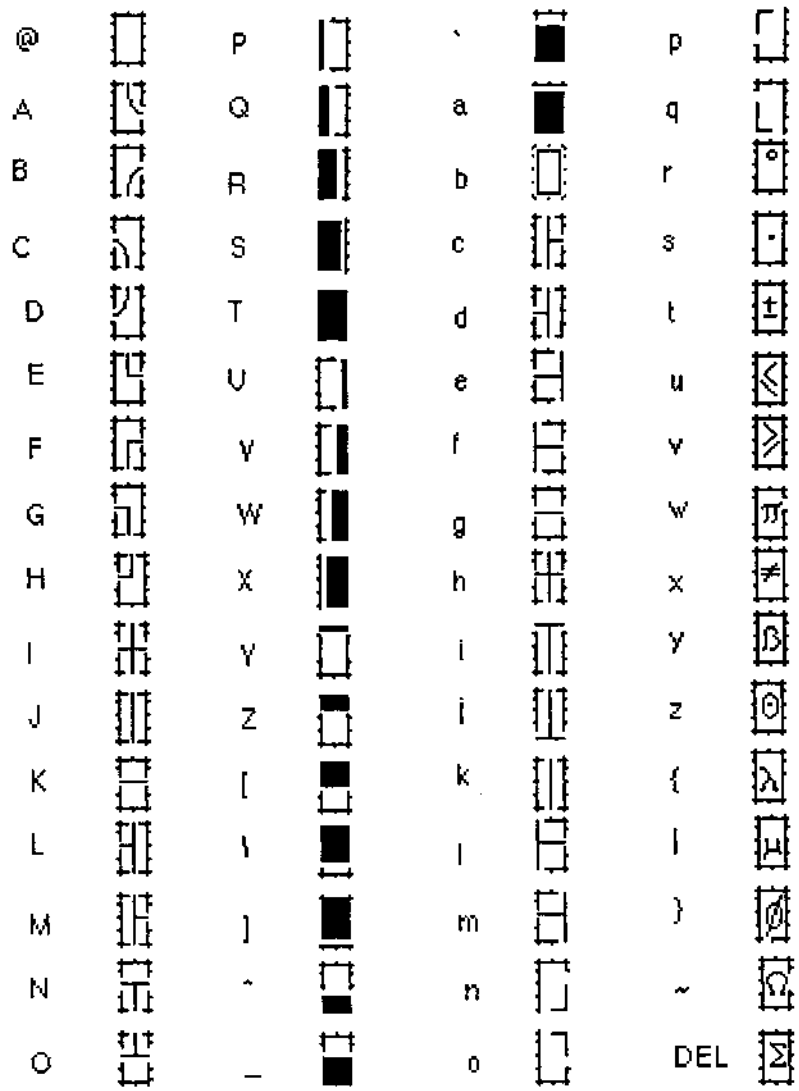


Figure 4-2. TV924 Special Graphics

4.5.4 925

Function Keys

Function commands may also be transmitted by pressing a function key (Fn) or SHIFT/Fn. See Table 4-2 for a list of codes transmitted.

Video Attributes

A video attribute or combination thereof is denoted by a three-character escape sequence:

ESC G n

where "n" is the value associated with the attribute or combination. The value of "n" associated with an attribute is given in Table 4-7.

Clearing Data

There are several ways to clear data from the screen and/or host's memory. Table 4-8 lists different ways to clear data in this emulation.

Setting the Time

The time of day may be set by entering the sequence

ESC space 1 N HH MM

where N = meridiem, A=AM, P=PM
HH =hour, two digits: 01 to 12
MM =minutes two digits: 00 to 59

For example, to set the time to 1:15 PM, enter

ESC space 1 P 01 15

Remember, 1:15 PM is displayed as 13-45.

Host Request Time-of-Day

The host may request the time-of-day by sending to the terminal the sequence

ESC space 2

The terminal responds

N HH MM CR (carriage return)

Table 4-7. TeleVideo Video Attribute Codes

Attribute	Escape Sequence ESC G ...
normal	0
blank	1
flash	2
blank flash	3
reverse	4
blank reverse	5
flash reverse	6
blank flash reverse	7
underline	8
blank underline	9
flash underline	:
blank flash underline	;
reverse underline	<
blank reverse underline	=
flash reverse underline	>
blank flash reverse underline	?

Table 4-8. TeleVideo Clear Command Codes

Command	TV910	TV920	TV924	TV925	TV950
Clear Unprotected to Nulls		ESC :	ESC * 2	ESC :	ESC :
Clear Unprotected to Insert-Characters		CTRL/Z	ESC * 3 CTRL/Z	ESC ; ESC + CTRL/Z	ESC ; ESC = CTRL/Z
Clear All to Nulls	ESC *	ESC *	ESC * 0	ESC *	ESC *
Clear All to Spaces	ESC + CTRL/Z	ESC +	ESC * 1		
Clear Unprotected to Half Intensity Spaces				ESC ,	ESC ,

4.5.5 950

Function Keys

Function commands may also be transmitted by pressing a function key (Fn) or SHIFT/Fn. See Table 4-2 for a list of codes transmitted.

Programming the Function Keys

The sequence transmitted by pressing a function key may be changed (programmed) by the operator.

To program a function key, enter the sequence

ESC | p1 p2 message **CTRL/Y**

where
- p1 denotes the function key to be programmed (Table 4-9),
- p2 denotes where the code will be transmitted (Table 4-10),
- message denotes the desired function, and
- CTRL/Y is the mandatory termination character.

Table 4-9. Values of p1 for TV950 Fn Keys

Function Key	For Fn, p1 is	For SHIFT/Fn, p1 is
F1	1	A
F2	2	B
F3	3	C
F4	4	D
F5	5	E
F6	6	F
F7	7	G
F8	8	H
F9	9	I
F10	:	J
F11	;	K
F12	<	L
F13	=	M
F14	>	N
F15	?	O
F16	@	P

Table 4-10. Values of p2 for TV950 Fn Keys

If p2 is	New function code sent to
1	computer (full duplex)
2	screen only (local)
3	computer and screen (half duplex)

The "message" is the desired function: a string of ASCII characters, control codes, and escape sequences. Total memory available for storing new function key codes is 6K bytes. If desired, all storage may be devoted to reprogramming one function key. Be careful when programming: if you make a mistake while typing, you will need to start over.

Note: If "CTRL/Y" is to be part of the message, enter the Bypass Code

CTRL/P

immediately before the CTRL/Y. The Bypass Code denotes that the following code is to be part of the message. As you might expect, you include the Bypass Code itself in the the message in the same way: CTRL/P CTRL/P

FOR EXAMPLE,

ESC p1 p2	message	CTRL/Y
ESC 1 1	TURN ON PRINTER CR	CTRL/Y

programs F1 to send the message "TURN ON PRINTER" to the host.

Video Attributes

A video attribute or combination thereof is denoted by a three-character escape sequence:

ESC G n

where "n" is the value associated with the attribute or combination. The value of "n" associated with an attribute is given in Table 4-7.

Clearing Data

There are several ways to clear data from the screen and/or host's memory. Table 4-8 lists different ways to clear data in this emulation.

Special Graphics

Figure 4-3 lists the graphics symbols available in this emulation and the key used to generate each symbol.

To turn on the graphics characters,
in Set-Up, choose GRAPH ON, or
enter the sequence **ESC $**

To turn off the graphics characters,
in Set-Up, choose GRAPH OFF, or
enter the sequence **ESC %**

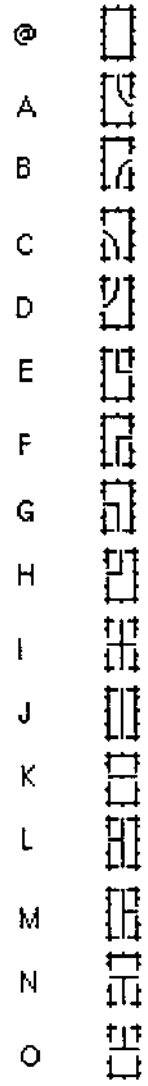


Figure 4-3. TV950 Special Graphics

4.6 WYSE

4.6.1 WY-50

Function Keys

Pressing a function key transmits a three-character sequence:

Lead-in Code	ASCII Code	Terminator Code
SOH	m	CR

where "m" is the value associated with the function key. The value of "m" for each key is given in Table 4-11.

Table 4-11. WY-50 Function Key ASCII Code Values

Function Key	If Fn, m is	n is	If SHIFT/Fn, m is	n is
F1	@	0	'	P
F2	A	1	a	Q
F3	B	2	b	R
F4	C	3	c	S
F5	D	4	d	T
F6	E	5	e	U
F7	F	6	f	V
F8	G	7	g	W
F9	H	8	h	X
F10	I	9	i	Y
F11	J	:	j	Z
F12	K	;	k	[
F13	L	<	l	\
F14	M	=	m	]
F15	N	>	n	^
F16	O	?	o	-

Programming the Function Keys

You can change the sequence transmitted by pressing a function key. Function keys can be programmed either in Set-Up or by entering an escape sequence.

To program a function key in Set-Up,

1. Press SHIFT/NO SCROLL (= SET UP).

2. Scroll through the Set-Up lines to Set-Up Line 8.

3. Press the function key to be programmed:

If you press	the displays shows
Fn	Fn =
SHIFT/Fn.	sFn =

4. Enter the desired contents for the key.

Note: Up to eight characters/control codes may be entered. To enter a CR, press ENTER on the numeric keypad.

5. Press RETURN to denote the end of the sequence and select the next function key in the sequence.

6. Repeat steps 3 - 5 for each function key to be changed.

7. The programmed function keys are saved in non-volatile memory and will remain in effect, even if the terminal is turned off and then on.

To program a function key using an escape sequence, enter the sequence

ESC z m seq **DEL**

where m denotes the function key to be programmed (see Table 4-11)
seq denotes the desired code sequence (up to eight characters).
DEL termination delimiter

To program the Label (User) Line with a message for a function key, enter the sequence

ESC z n text **CR**

where n denotes the label field (in which the message will appear) for the function key (see Table 4-11)
text denotes the desired message (up to eight characters).
CR termination delimiter

Clearing Data

There are several ways to clear data from the screen and/or host's memory. Table 4-12 lists different ways to clear data in this emulation.

Table 4-12. WY-50 Clear Command Codes

Command	WY-50
Clear Unprotected to Nulls	ESC :
Clear Unprotected to Spaces	ESC ; CTRL/Z
Clear All to Nulls	ESC *
Clear All to Spaces	ESC +
Clear All to Half Intensity Spaces	ESC ,

Special Graphics

Figure 4-4 lists the graphics symbols available in this emulation and the key used to generate each symbol. Graphics characters will always be displayed with the selected protect attribute and will be proteced if PROT ON is set.

To turn on the graphics characters,
in Set-Up, choose GRAPH ON, or
enter the sequence **ESC H CTRL/B**

To turn off the graphics characters,
in Set-Up, choose GRAPH OFF, or
enter the sequence **ESC H CTRL/C**

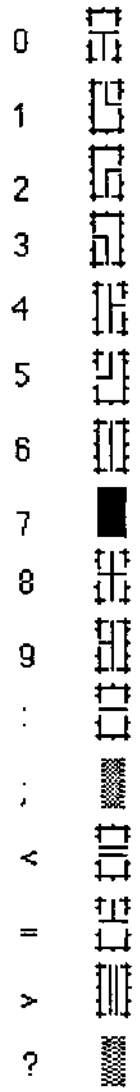


Figure 4-4. WY-50 Special Graphics

Video Attributes

A video attribute or combination thereof is denoted by a three-character escape sequence:

ESC G n

where "n" is the value associated with the attribute or combination. The value of "n" associated with an attribute is given in Appendix D.

Split Screen

The display may be split into an upper and lower segment; either of which may be "active"

To set split the screen at a particular row, enter the sequence

ESC x 1 N

where N denotes the desired row (in ASCII) (see Appendix G)

To reset to full screen, enter the sequence

ESC x 0

To move the cursor to a particular row and column of a split screen, enter the sequence

ESC - n r c

where **n** denotes the desired segment (0 = top segment, 1=bottom segment)
r denotes the desired row (in ASCII) (see Appendix G)
c denotes the desired column (in ASCII) (see Appendix G)

NOTE: cursor addressing is relative to the active segment. For example, in a segment containing 10 rows, the last row is row 10.

Miscellaneous Differences

1. Smooth scroll rates are slightly faster on the *Ampex 230 plus* than on the WY-50.

2. On the *Ampex 230 plus*, the CRT Saver turns the screen off after 10 minutes. On the WY-50, it turns the screen off after 17.

3. PAGE is used (instead of PREV PAGE NEXT) to select the active segment.

4. *Ampex 230 plus* keys repeat at a rate about 25% faster than WY-50 keys.

5. When reprogramming function keys, up to eight character/key codes may be retained at power off/on.

6. There is no INSERT/REPLACE key on the *Ampex 230 plus*. Instead,

   to insert,
   press CTRL/CHAR INSERT, or
   enter the sequence **ESC q**

   to replace,
   press SHIFT/CTRL/CHAR INSERT, or
   enter the sequence **ESC r**

CHAPTER V
TROUBLESHOOTING

This section explains basic guidelines for the care and feeding of the terminal and for simple troubleshooting should a problem arise in operating the unit.

5.1 MAINTENANCE

If handled carefully, the terminal requires no maintenance.

5.2 TROUBLESHOOTING

If	Check that
the terminal won't turn on	the power switch is on; the AC cord is plugged into the wall; the wall outlet is "live" (plug in a working radio); and the terminal's fuse is not blown (see Figure 1-4).
the terminal doesn't seem to be communicating with the host	the I/O cable between host and terminal is properly connected (to the terminal's primary port); the communications mode is CONV; the primary port is working properly (see primary port test below).
nothing is displayed when you type	the keyboard cable is plugged into the display unit; the keyboard is unlocked (To unlock, press CTRL/SHIFT/RESET).
the display is jumbled	the baud rate of the primary port matches that of the host; the number of data bits matches that of the host; the parity matches that of the host; the screen is NOT set for Monitor mode (to turn off: press CTRL/2)
you can't seem to print	the printer's port and terminal's auxiliary port are the same type (e.g., RS232C); the I/O cable between terminal and printer is properly connected (and pin signal assignments match); the number of data bits matches that of the printer; the parity matches that of the printer; the number of stop bits matches that of the printer; the baud rate is set properly (see Section 3.8); the printer port is working properly (see printer port test below); the printer test below works.

Primary Port Test

To check that the primary port is functioning properly,

1. Make sure the terminal is set to CONV and FDX.
2. Connect pin 2 of the primary port to pin 3 of the primary port.
3. Type in text from the keyboard.

4a. If the primary port is working properly, the text is displayed as expected on the terminal screen.

4b. If the port is not working properly, text will not be displayed as expected. If the port is not working properly, consult your Ampex Service Representative.

Printer Port Test

To check that the printer port is functioning properly,

1. Make sure the terminal is set to CONV and FDX.
2. Connect pin 2 of the primary port to pin 3 of the printer port.
3. Type in 2 lines of text from the keyboard.
4. Press the PRINT key.

5a. If the auxiliary port is working properly, the "printed" text is displayed on the terminal screen, immediately below the typed text. The printed text should be identical to the typed text, except for a blank line separating the first and second lines of printed text.

5b. If the port is not working properly, text will not be displayed as described above. If the port is not working properly, consult your Ampex Service Representative.

5.2.1 Printing Test

To check for proper communication between the terminal and a printer attached to it, use the following test.

NOTE: before doing the test, make sure the terminal is NOT connected to a host or to a modem.

1. In Set-Up (Line 1), choose BLOCK mode.
2. Press SHIFT/S to save the choice.
3. Type in several lines of text.
4. Press the PRINT key to print the text. If the printer prints all data from the HOME position to the cursor position, everything is okay. If something else happens, refer to the Troubleshooting list above.

B.1 PRIMARY PORT INTERFACE

B.1.1 Current Loop Interface

1. Install a snap-on mounting clip (P/N 283-339) into each of the 4 mounting holes on the controller board (see figure). Make sure wings of each clip do not interfere with components on the board.

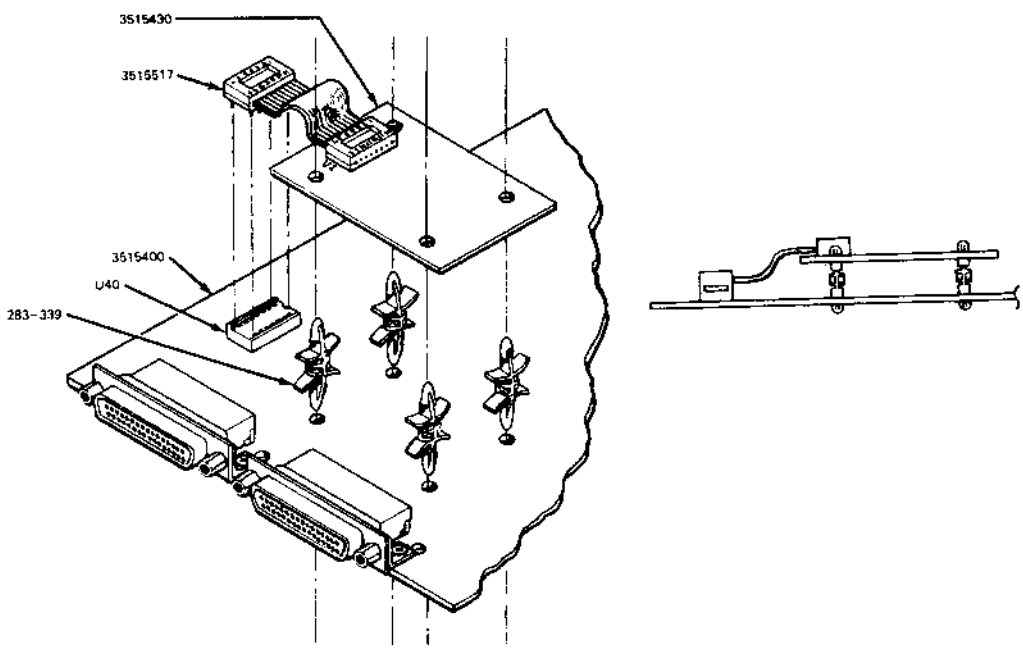
2. Orient U1 on the Current Loop Board (P/N 3515430) toward the left side of the terminal controller board (see figure).

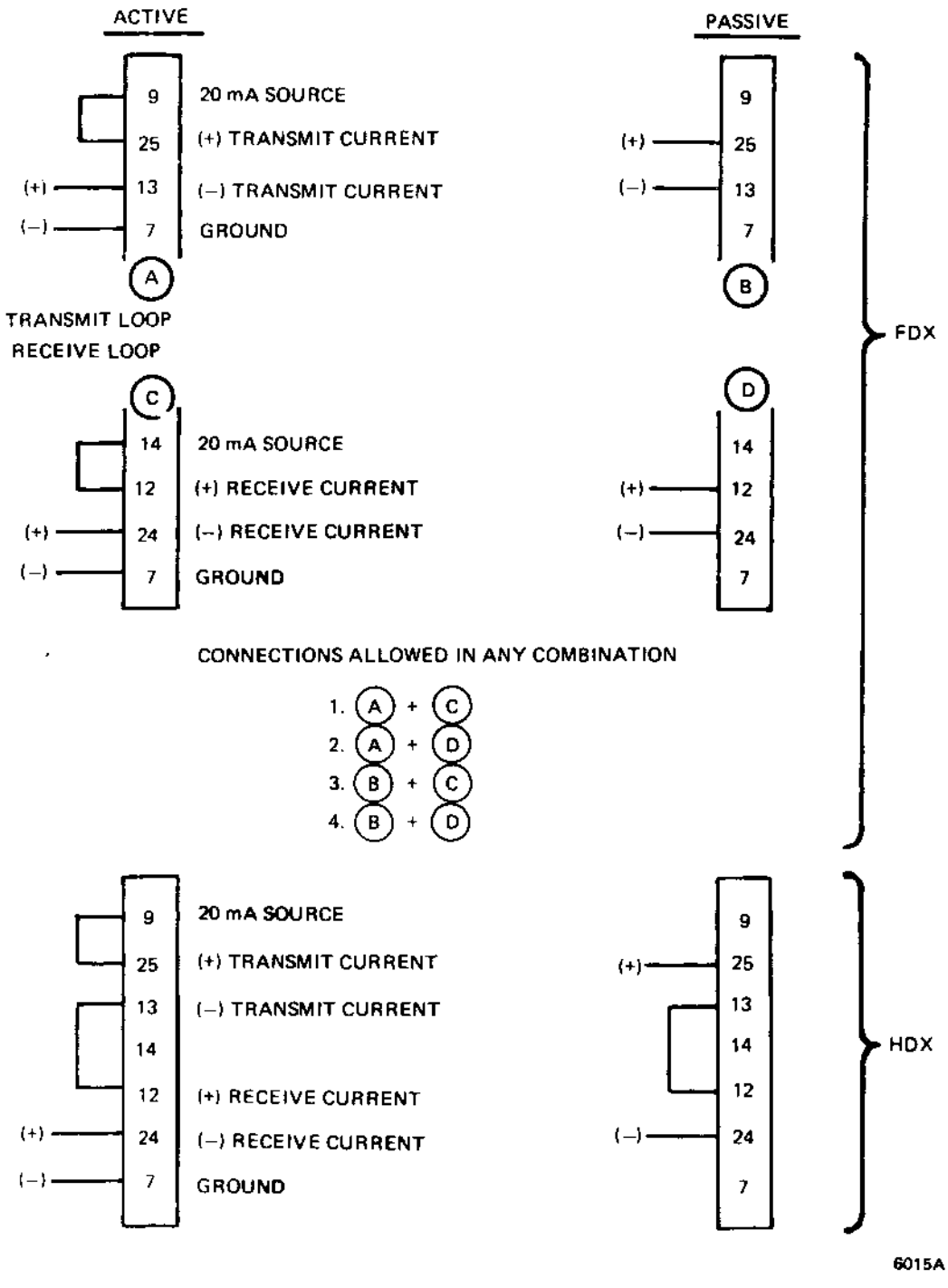
3. Attach the Current Loop Board to the mounting clips on the controller board.

4. Aligning pin 1 of cable assembly (P/N 3515517) with pin 1 hole of U1 of Current Board and pin 1 hole of U40 of controller board, install cable assembly between Current and Controller boards. NOTE: If alternate cable assembly (P/N 636-215) is used, use wire tie (P/N 302-335) to secure excess cable to lower-left side mounting clip.

5. Pin signal assignments for the current loop option are:

9	20mA source
14	20mA source
13	Transmit current (-)
25	Transmit current (+)
24	Receive current (-)
12	Receive current (+)
7	Ground
1	Chassis Ground




ACTIVE
PASSIVE
9
25
13
7
20 mA SOURCE
(+) TRANSMIT CURRENT
(–) TRANSMIT CURRENT
GROUND
(+)
(–)
A
B
TRANSMIT LOOP
RECEIVE LOOP
C
D
14
12
24
7
20 mA SOURCE
(+) RECEIVE CURRENT
(–) RECEIVE CURRENT
GROUND
FDX
CONNECTIONS ALLOWED IN ANY COMBINATION
1. A + C
2. A + D
3. B + C
4. B + D
HDX
6015A

B.1.2 RS422 Interface

1. Install a snap-on mounting clip (P/N 283-339) into each of the 4 mounting holes on the controller board (see figure). Make sure wings of each clip do not interfere with components on the board.

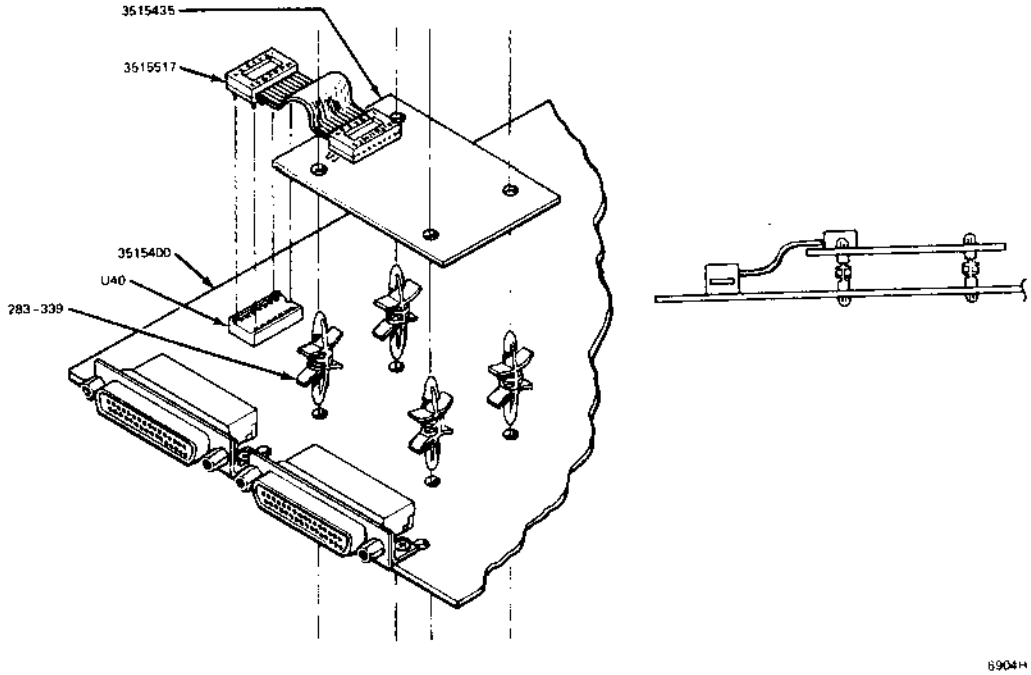
2. Orient U1 on the RS422 Interface Board (P/N 3515435) toward the left side of the terminal controller board (see figure).

3. Attach the RS422 Interface Board to the mounting clips on the controller board.

4. Aligning pin 1 of cable assembly (P/N 3515517) with pin 1 hole of U1 of Interface Board and pin 1 hole of U40 of controller board, install cable assembly between Interface and Controller boards. NOTE: If alternate cable assembly (P/N 636-215) is used, use wire tie (P/N 302-335) to secure excess cable to lower-left side mounting clip.

5. Pin signal assignments for the RS422 port are:

15	Receive Data (+)
17	Receive Data (-)
19	Transmit Data (+)
25	Transmit Data (-)
7	Ground
1	Chassis Ground



Cursor Control	
Back Tab	ESC I
Home	CTRL/^
Cursor Down; No Scroll	CTRL/V
Line Feed; Scroll	CTRL/J
Cursor Left	CTRL/H
Cursor Right	CTRL/L
Cursor Up	CTRL/K
Reverse Line Feed	ESC j
Carriage Return	CTRL/M
New Line	CTRL/_
Tab	CTRL/I
Field Tab	ESC i
Address Cursor (r, c)	ESC =
Read Cursor (r,c)	ESC ?
Address Cursor (p, r, c)	ESC -
Read Cursor (p, r, c)	ESC /
Adress Cursor (rrRcccC)	ESC . 9
Write at Hidden Cursor	ESC . D

Cursor Attributes	
Flashing Block Cursor	ESC . 1
Steady Block Cursor	ESC . 2
Flashing Underline Crsr	ESC . 3
Steady Underline Cursor	ESC . 4
Cursor off	ESC . 0

Edit Commands	
Clear all to Nulls	ESC *
Clear Unprot. to Space	ESC ;
	ESC +
	CTRL/Z
Clear Unprot. to Null	ESC :
Clear Unprot. to H.I.	ESC ,
Clear Unprot. Flds to sps	CTRL/X
Load Blank Character	ESC e
Erase EOL to Spaces	ESC T
Erase EOL to Nulls	ESC t
Erase EOP to Spaces	ESC Y
Erase EOP to Nulls	ESC y
Line Mode	ESC O
Page Mode	ESC N
Insert Mode	ESC q
Edit Mode	ESC r
Character Insert	ESC Q
Character Delete	ESC W
Line Insert	ESC E
Line Delete	ESC R
Set Column Tab	ESC 1
Clear Column Tab	ESC 2
Clear All Tabs	ESC 3

Display Control	
Normal	ESC G 0
Blank	ESC G 1
Flash	ESC G 2
Blank Flash	ESC G 3
Reverse	ESC G 4
Blank Reverse	ESC G 5
Flash Reverse	ESC G 6
Blank Flash Reverse	ESC G 7
Underline	ESC G 8
Blank Underline	ESC G 9
Flash Underline	ESC G :
Blank Flash Underline	ESC G ;
Reverse Underline	ESC G <
Blank Reverse Underline	ESC G =
Flash Reverse Underline	ESC G >
Blank Flash Rvrs Undln	ESC G ?
Normal H.I.	ESC G p
Blank H.I.	ESC G q
Flash H.I.	ESC G r
Blank Flash H.I.	ESC G s
Reverse H.I.	ESC G t
Blank Reverse H.I.	ESC G u
Flash Reverse H.I.	ESC G v
Blank Flash Reverse H.I.	ESC G w
Underline H.I.	ESC G x
Blank Underline H.I.	ESC G y
Flash Underline H.I.	ESC G z
Blank Flash Underline H.I.	ESC G {
Reverse Underline H.I.	ESC G |
Blank Rvrs Underline H.I.	ESC G }
Flash Rvrs Underline H.I.	ESC G ~
Blank Flsh Rvrs Undln H.I.	ESC G DEL
Reverse Video On/Off	---
Black on White	ESC b
White on Black	ESC d
Normal Screen	ESC n
Blank Screen	ESC o
Define Block of Graphics	ESC ^
Reset Double-Wide Chrtr	ESC p 0
Double-Wide Character	ESC p 1
Set Upper Dbl-High Line	ESC m 1
Set Lower Dbl-High Line	ESC m 2
Reset Upper/Lower DH	ESC m 0
Embedded Attributes	ESC . 7
Non-embd Attributes	ESC . 8
Attribute Field Set	ESC . B

Mode Control

Block Mode On	ESC B
Conversation Mode On	ESC C
Full Duplex	ESC D F
Half Duplex	ESC D H
Set Local Edit	ESC k
Set Duplex Edit	ESC l
Protect Mode On	ESC &
Protect Mode Off	ESC '
Write Protect On	ESC)
Write Protect Off	ESC (
Graphics Mode On	ESC $
Graphics Mode Off	ESC %
Monitor Mode On	ESC U
	CTRL/1
Monitor Mode Off	ESC u
	ESC X
	CTRL/2

Programming Functions

Program Field Terminator	ESC x 0
Program Line Terminator	ESC x 1
Program Start Prot. Term.	ESC x 2
Program End Prot. Term.	ESC x 3
Program Page Term.	ESC x 4
Configure Host Port	ESC {
Configure Aux. Port	ESC }
Program One Edit Key	ESC 0
Program all Edit Key (Uns)	ESC] 0
Program all Edit Key (Sh)	ESC] 1
Program a Function Key	ESC |
Program Send Key (Uns)	ESC 0 1
Program Send Key (Sh)	ESC 0 2
Execute Prog. Func. Key	ESC . A

Special Functions

Load User Line	ESC f
Display User Line	ESC g
Blank User Line	ESC h
Display Control Character	ESC F

Terminal Control

Smooth Scroll On	ESC 8
Jump Scroll On	ESC 9
Flip Mode On	ESC v
Flip Mode Off	ESC w
Set 24 line/page	ESC \ 1
Set 48 line/page	ESC \ 2
Set 96 line/page	ESC \ 3
(Go to) Previous Page	ESC J
(Go to) Next Page	ESC K
80 column Mode	ESC . 5
132 column mode	ESC . 6
Set Split Screen	ESC _
Line lock	ESC ! 1
Clear all line lock	ESC ! 2
Lock Keyboard	ESC #
Unlock Keyboard	ESC "
Key Click On	ESC >
Key Click Off	ESC <
Bell	CTRL/G
Load/Read Time	ESC . C

Transmission to Host

Enable XON/XOFF	CTRL/O
Disable XON/XOFF	CTRL/N
Send Line Unprotect	ESC 4
Send Page Unprotect	ESC 5
Send Line All	ESC 6
Send Page All	ESC 7
Send Message Unprotect	ESC S
Send Message All	ESC s
Send Status Line	ESC Z 1
Send User Line	ESC Z 0
Send Terminal ID	ESC M

Transmit to Printer

Local Print	ESC P
Exten'n Print (CCP) On	ESC @
Exten'n Print (CCP) Off	ESC A
Transp't Print (TPR) On	ESC `
Transp't Print (TPR) Off	ESC a
Bidirectional Print On	CTRL/R
Bidirectional Print Off	CTRL/T
Unformatted Print	ESC L

Cursor Control	TV910	TV920	TV924	TV925	TV950
Back Tab	ESC I	ESC I	ESC I	ESC I	ESC I
Home	CTRL/^	CTRL/^	CTRL/^	CTRL/^	CTRL/^
Cursor Down ; No Scroll	---	---	CTRL/V	CTRL/V	CTRL/V
Line Feed ; Scroll	CTRL/J	CTRL/J	CTRL/J	CTRL/J	CTRL/J
Cursor Left	CTRL/H	CTRL/H	CTRL/H	CTRL/H	CTRL/H
Cursor Right	CTRL/L	CTRL/L	CTRL/L	CTRL/L	CTRL/L
Cursor Up	CTRL/K	CTRL/K	CTRL/K	CTRL/K	CTRL/K
Reverse Line Feed	ESC j	---	ESC j	ESC j	ESC j
Carriage Return	CTRL/M	CTRL/M	CTRL/M	CTRL/M	CTRL/M
New Line	CTRL/_	CTRL/_	CTRL/_	CTRL/_	CTRL/_
Tab	CTRL/I	CTRL/I	CTRL/I	CTRL/I	CTRL/I
Field Tab	**ESC i**	**ESC i**	ESC i	ESC i	ESC i
Address Cursor (r, c)	ESC =	ESC =	ESC =	ESC =	ESC =
Read Cursor (r,c)	ESC ?	ESC ?	ESC ?	ESC ?	ESC ?
Address Cursor (p, r, c)	---	---	ESC -	ESC -	ESC -
Read Cursor (p, r, c)	---	---	ESC /	ESC /	ESC /
Address Cursor (n, r, c)	---	---	---	---	---
Read Cursor (n, r, c)	---	---	---	---	---
Address Cursor (rrRcccC)	---	---	---	---	---
Read Cursor (rrRcccC)	---	---	---	---	---
Write at Hidden Cursor	---	---	ESC L	---	---
Activate Alternate Segm't	---	---	---	---	---
Activate Segment 1	---	---	---	---	---
Activate Segment 0	---	---	---	---	---
Home Segment	---	---	---	---	---
Address Cursor (row)	ESC [	---	---	**ESC [**	---
Address Cursor (column)	ESC]	---	---	**ESC]**	---
Address Cursor (c, r)	---	---	---	---	---
Read Cursor (c, r)	---	---	---	---	---

Cursor Control	A210	VP-A1	VP-A2	H1500	WY-50
Back Tab	ESC I	**ESC I**	**ESC I**	**ESC I**	ESC I
Home	CTRL/^	CTRL/A	CTRL/A	~CTRL/R	CTRL/^
Cursor Down ; No Scroll	CTRL/V	**CTRL/V**	**CTRL/V**	~CTRL/K	CTRL/V
Line Feed ; Scroll	CTRL/J	CTRL/J	CTRL/J	CTRL/J	CTRL/J
Cursor Left	CTRL/H	CTRL/U	CTRL/U	CTRL/H	CTRL/H
		CTRL/H	CTRL/H		
Cursor Right	CTRL/L	CTRL/F	CTRL/F	CTRL/P	CTRL/L
Cursor Up	CTRL/K	CTRL/Z	CTRL/Z	~CTRL/L	CTRL/K
Reverse Line Feed	ESC j	**ESC j**	**ESC j**	**ESC j**	ESC j
Carriage Return	CTRL/M	CTRL/M	CTRL/M	CTRL/M	CTRL/M
New Line	CTRL/_	CTRL/_	CTRL/_	---	CTRL/_
Tab	CTRL/I	**CTRL/I**	**CTRL/I**	---	CTRL/I
Field Tab	ESC i	**ESC i**	**ESC i**	CTRL/I	ESC i
Address Cursor (r, c)	ESC =	ESC Y	ESC Y	**ESC =**	ESC =
Read Cursor (r,c)	ESC ?	**ESC ?**	**ESC ?**	---	ESC ?
Address Cursor (p, r, c)	---	---	---	---	---
Read Cursor (p, r, c)	---	---	---	---	---
Address Cursor (n, r, c)	---	**ESC -**	**ESC -**	---	ESC -
Read Cursor (n, r, c)	---	**ESC /**	**ESC /**	---	ESC /
Address Cursor (rrRcccC)	---	**ESC a**	**ESC a**	---	ESC a
Read Cursor (rrRcccC)	---	**ESC b**	**ESC b**	---	ESC b
Write at Hidden Cursor	---	---	---	---	---
Activate Alternate Segm't	---	**ESC J**	**ESC J**	---	ESC J
					ESC K
Activate Segment 1	---	**ESC }**	**ESC }**	---	ESC }
Activate Segment 0	---	**ESC]**	**ESC]**	---	ESC]
Home Segment	---	**ESC {**	**ESC {**	---	ESC {
Address Cursor (row)	ESC [	**CTRL/K**	CTRL/K	---	---
Address Cursor (column)	ESC]	**CTRL/P**	CTRL/P	---	---
Address Cursor (c, r)	---	---	---	~CTRL/Q	---
Read Cursor (c, r)	---	---	---	~CTRL/E	---

Edit Commands	TV910	TV920	TV924	TV925	TV950
Clear all to Nulls	ESC *	ESC *	ESC * 0	ESC *	ESC *
Clear all to Spaces	ESC + CTRL/Z	ESC +	ESC * 1	---	---
Clear all to H.I.	---	---	---	---	---
Clear Unprot. to Space	**ESC ;**	**ESC ;**	ESC * 3	ESC ; ESC + CTRL/Z	ESC ; ESC + CTRL/Z
Clear Unprot. to Null	**ESC :**	ESC : CTRL/Z	ESC * 2 CTRL/Z	ESC :	ESC :
Clear Unprot. to H.I.	**ESC ,**	**ESC ,**	---	ESC ,	ESC ,
Clear Unprot. Flds to sps	---	---	CTRL/X	---	---
Load Blank Character	---	---	---	---	ESC e
Clear Foreground	----	---	---	---	---
Erase EOL to Spaces	ESC T	ESC T	ESC T	ESC T	ESC T
Erase EOL to Nulls	**ESC t**	ESC t	ESC t	ESC t	ESC t
Erase EOP to Spaces	ESC Y	ESC Y	ESC Y	ESC Y	ESC Y
Erase EOP to Nulls	**ESC y**	ESC y	ESC y	ESC y	ESC y
Erase Page to Bkgd Spc	---	---	---	---	---
Page mode	---	---	ESC N 1	---	ESC N
Line mode	---	---	ESC N 0	---	ESC O
Insert mode	**ESC q**	**ESC z**	**ESC q**	**ESC q**	ESC q
Edit mode	**ESC r**	**ESC r**	**ESC r**	**ESC r**	ESC r
Character Insert	**ESC Q**	ESC Q	ESC Q	ESC Q	ESC Q
Character Delete	**ESC W**	ESC W	ESC W	ESC W	ESC W
Line Insert	**ESC E**	ESC E	ESC E	ESC E	ESC E
Line Delete	**ESC R**	ESC R	ESC R	ESC R	ESC R
Set Column Tab	ESC 1	ESC 1	ESC 1	ESC 1	ESC 1
Clear Column Tab	ESC 2	ESC 2	ESC 2	ESC 2	ESC 2
Clear All Tabs	ESC 3	ESC 3	ESC 3	ESC 3	ESC 3

Edit Commands	A210	VP-A1	VP-A2	H1500	WY-50
Clear all to Nulls	ESC *	**ESC ***	**ESC ***	**ESC ***	ESC *
Clear all to Spaces	---	**ESC +** CTRL/L	**ESC +** CTRL/L	~CTRL/\	ESC +
Clear all to H.I.	---	**ESC ,**	**ESC ,**	---	ESC ,
Clear Unprot. to Spaces	ESC ; ESC + CTRL/Z	**ESC ;**	**ESC ;**	**ESC ;** **ESC +**	ESC ; CTRL/Z
Clear Unprot. to Nulls	ESC :	**ESC :**	**ESC :**	**ESC :**	ESC :
Clear Unprot. to H.I.	ESC ,	---	---	**ESC ,**	---
Clear Unprot. Flds to sp's	----	---	---	---	---
Load Blank Character	----	---	---	---	---
Clear Foreground	----	---	---	~CTRL/]	---
Erase EOL to Spaces	ESC T	ESC K	ESC K	~CTRL/O	ESC T
Erase EOL to Nulls	**ESC t**	**ESC t**	**ESC t**	**ESC t**	ESC t
Erase EOP to Spaces	ESC Y	ESC k	ESC k	~CTRL X	ESC Y
Erase EOP to Null	**ESC y**	**ESC y**	**ESC y**	**ESC y**	ESC y
Erase Page to Bkgd Spc	---	---	---	~CTRL/W	---
Line mode	---	---	---	---	---
Page mode	---	---	---	---	---
Insert mode	**ESC q**	**ESC q**	**ESC q**	**ESC q**	ESC q
Edit mode	**ESC r**	**ESC r**	**ESC r**	**ESC r**	ESC r
Character Insert	ESC Q	**ESC Q**	**ESC Q**	**ESC Q**	ESC Q
Character Delete	ESC W	**ESC W**	**ESC W**	**ESC W**	ESC W
Line Insert	ESC E	**ESC M**	**ESC M**	~CTRL/Z	ESC E
Line Delete	ESC R	**ESC I**	**ESC I**	~CTRL/S	ESC R
Set Column Tab	ESC 1	**ESC 1**	**ESC 1**	---	ESC 1
Clear Column Tab	ESC 2	**ESC 2**	**ESC 2**	---	ESC 2
Clear All Tabs	ESC 3	---	---	---	ESC 0

Display Control	TV910	TV920	TV924	TV925	TV950
Normal	ESC G 0	---	ESC G 0	ESC G 0	ESC G 0
Blank	ESC G 1	---	ESC G 1	ESC G 1	ESC G 1
Flash	ESC G 2	---	ESC G 2	ESC G 2	ESC G 2
Blank Flash	ESC G 3	---	ESC G 3	ESC G 3	ESC G 3
Reverse	ESC G 4	---	ESC G 4	ESC G 4	ESC G 4
Blank Reverse	ESC G 5	---	ESC G 5	ESC G 5	ESC G 5
Flash Reverse	ESC G 6	---	ESC G 6	ESC G 6	ESC G 6
Blank Flash Reverse	ESC G 7	---	ESC G 7	ESC G 7	ESC G 7
Underline	ESC G 8	---	ESC G 8	ESC G 8	ESC G 8
Blank Underline	ESC G 9	---	ESC G 9	ESC G 9	ESC G 9
Flash Underline	ESC G :	---	ESC G :	ESC G :	ESC G :
Blank Flash Underline	ESC G ;	---	ESC G ;	ESC G ;	ESC G ;
Reverse Underline	ESC G <	---	ESC G <	ESC G <	ESC G <
Blank Reverse Underline	ESC G =	---	ESC G =	ESC G =	ESC G =
Flash Reverse Underline	ESC G >	---	ESC G >	ESC G >	ESC G >
Blank Flash Rvrs Undln	ESC G ?	---	ESC G ?	ESC G ?	ESC G ?
Normal H.I.	---	---	ESC G (sp)	---	---
Blank H.I.	---	---	ESC G !	---	---
Flash H.I.	---	---	ESC G "	---	---
Blank Flash H.I.	---	---	ESC G #	---	---
Reverse H.I.	---	---	ESC G $	---	---
Blank Reverse H.I.	---	---	ESC G %	---	---
Flash Reverse H.I.	---	---	ESC G &	---	---
Blank Flash Reverse H.I.	---	---	ESC G '	---	---
Underline H.I.	---	---	ESC G (	---	---
Blank Underline H.I.	---	---	ESC G)	---	---
Flash Underline H.I.	---	---	ESC G *	---	---
Blank Flash Underline H.I.	---	---	ESC G +	---	---
Reverse Underline H.I.	---	---	ESC G ,	---	---
Blank Rvrs Underline H.I.	---	---	ESC G -	---	---
Flash Rvrs Underline H.I.	---	---	ESC G .	---	---
Blank Flsh Rvrs Undln H.I.	---	---	ESC G /	---	---

Display Control	A210	VP-A1	VP-A2	H1500	WY-50
Normal	ESC G 0	ESC G 0	ESC G 0	ESC G 0	ESC G 0
Blank	ESC G 1	ESC G 1	ESC G 1	ESC G 1	ESC G 1
Flash	ESC G 2	ESC G 2	ESC G 2	ESC G 2	ESC G 2
Blank Flash	ESC G 3	ESC G 3	ESC G 3	ESC G 3	ESC G 3
Reverse	ESC G 4	ESC G 4	ESC G 4	ESC G 4	ESC G 4
Blank Reverse	ESC G 5	ESC G 5	ESC G 5	ESC G 5	ESC G 5
Flash Reverse	ESC G 6	ESC G 6	ESC G 6	ESC G 6	ESC G 6
Blank Flash Reverse	ESC G 7	ESC G 7	ESC G 7	ESC G 7	ESC G 7
Underline	ESC G 8	ESC G 8	ESC G 8	ESC G 8	ESC G 8
Blank Underline	ESC G 9	ESC G 9	ESC G 9	ESC G 9	ESC G 9
Flash Underline	ESC G :	ESC G :	ESC G :	ESC G :	ESC G :
Blank Flash Underline	ESC G ;	ESC G ;	ESC G ;	ESC G ;	ESC G ;
Reverse Underline	ESC G <	ESC G <	ESC G <	ESC G <	ESC G <
Blank Reverse Underline	ESC G =	ESC G =	ESC G =	ESC G =	ESC G =
Flash Reverse Underline	ESC G >	ESC G >	ESC G >	ESC G >	ESC G >
Blank Flash Rvrs Undln	ESC G ?	ESC G ?	ESC G ?	ESC G ?	ESC G ?
Normal H.I.	---	ESC G p	ESC G p	ESC G p	ESC G p
Blank H.I.	---	ESC G q	ESC G q	ESC G q	ESC G q
Flash H.I.	---	ESC G r	ESC G r	ESC G r	ESC G r
Blank Flash H.I.	---	ESC G s	ESC G s	ESC G s	ESC G s
Reverse H.I.	---	ESC G t	ESC G t	ESC G t	ESC G t
Blank Reverse H.I.	---	ESC G u	ESC G u	ESC G u	ESC G u
Flash Reverse H.I.	---	ESC G v	ESC G v	ESC G v	ESC G v
Blank Flash Reverse H.I.	---	ESC G w	ESC G w	ESC G w	ESC G w
Underline H.I.	---	ESC G x	ESC G x	ESC G x	ESC G x
Blank Underline H.I.	---	ESC G y	ESC G y	ESC G y	ESC G y
Flash Underline H.I.	---	ESC G z	ESC G z	ESC G z	ESC G z
Blank Flash Underline H.I.	---	ESC G {	ESC G {	ESC G {	ESC G {
Reverse Underline H.I.	---	ESC G |	ESC G |	ESC G |	ESC G |
Blank Rvrs Underline H.I.	---	ESC G }	ESC G }	ESC G }	ESC G }
Flash Rvrs Underline H.I.	---	ESC G ~	ESC G ~	ESC G ~	ESC G ~
Blank Flsh Rvrs Undln H.I.	---	ESC G DEL	ESC G DEL	ESC G DEL	ESC G DEL

Display Control	TV910	TV920	TV924	TV925	TV950
Start Blink	---	ESC ^	---	---	---
Start Blank	---	ESC _	---	---	---
End Blink/Blank	---	ESC q	---	---	---
Start Reverse Video	---	ESC j	---	---	---
End Reverse Video	---	ESC k	---	---	---
Start Underline	---	ESC l	---	---	---
End Underline	---	ESC m	---	---	---
Set Attribute	---	---	---	---	---
Tag Bit Set	---	---	---	---	---
Tag Bit Reset	---	---	---	---	---
Attribute Field Set	---	---	---	---	---
Black on White	**ESC b**	**ESC b**	ESC b	ESC b	ESC b
White on Black	**ESC d**	**ESC d**	ESC d	ESC d	ESC d
Normal Screen	**ESC n**	**ESC n**	ESC n 0	ESC n	ESC n
Blank Screen	**ESC o**	**ESC o**	ESC n 1	ESC o	ESC o
Define Blk of Attributes	---	---	ESC F	---	---
Define Blk of Graphics	---	---	ESC H	---	---
Set Field Attribute	---	---	---	---	---
Write Unprot. with Attr	---	---	---	---	---
Write Unprot. with Code	---	---	---	---	---
Set a Prot. Column	---	---	---	---	---
Normal Prot. Character	---	---	---	---	---
Reverse Prot. Character	---	---	---	---	---
H.I. Prot. Character	---	---	---	---	---
Logical Attr allow Alpha.	---	---	ESC g 1	---	---
Logical Attr. allow Numer.	---	---	ESC g 2	---	---
Logical Attr. requre Data	---	---	ESC g 4	---	---
Logical Attr. requre Alpha.	---	---	ESC g 5	---	---
Logical Attr. reqr Numer.	---	---	ESC g 6	---	---
Logical Attr. reqr Data Fill	---	---	ESC g 8	---	---
Logical Attr. reqr Alpha. Fill	---	---	ESC g 9	---	---
Logical Attr. reqr Numer. Fill	---	---	ESC g :	---	---
Logical Attribute Mode On	---	---	ESC o 1	---	---
Logical Attribute Mode Off	---	---	ESC o 0	---	---

Display Control	A210	VP-A1	VP-A2	H1500	WY-50
Start Blink	---	---	---	---	---
Start Blank	---	---	---	---	---
End Blink/Blank	---	---	---	---	---
Start Reverse Video	---	---	---	---	---
End Reverse Video	---	---	---	---	---
Start Underline	---	---	---	---	---
End Underline	---	---	---	---	---
Set Attribute	---	ESC 0	ESC 0	---	---
Tag Bit Set	---	CTRL/N	CTRL/N	---	---
Tag Bit Reset	---	CTRL/O	CTRL/O	---	---
Attribute Field Set	---	---	---	---	---
Black on White	ESC b	---	---	ESC b	---
White on Black	ESC d	---	---	ESC d	---
Normal Screen	ESC n	---	---	ESC n	---
Blank Screen	ESC o	---	---	ESC o	---
Define Blk of Attributes	---	---	---	---	---
Define Blk of Graphics	---	---	---	---	---
Set Field Attribute	---	ESC A	ESC A	---	ESC A
Write Unprot. with Attr	---	ESC !	ESC !	---	ESC !
Write Unprot. with Code	---	ESC .	ESC .	---	ESC.
Set a Prot. Column	---	ESC V	ESC V	---	ESC V
Normal Prot. Character	---	ESC'A	ESC'A	---	ESC'A
Reverse Prot. Character	---	ESC'6	ESC'6	---	ESC'6
H.I. Prot. Character	---	ESC'7	ESC'7	---	ESC'7
Logical Attr allow Alpha.	---	---	---	---	---
Logical Attr. allow Numer.	---	---	---	---	---
Logical Attr. requre Data	---	---	---	---	---
Logical Attr. requre Alpha.	---	---	---	---	---
Logical Attr. reqr Numer.	---	---	---	---	---
Logical Attr. reqr Data Fill	---	---	---	---	---
Logical Attr. reqr Alpha. Fill	---	---	---	---	---
Logical Attr. reqr Numer. Fill	---	---	---	---	---
Logical Attribute Mode On	---	---	---	---	---
Logical Attribute Mode Off	---	---	---	---	---

Mode Control	TV910	TV920	TV924	TV925	TV950
Block Mode On	**ESC B**	ESC B	ESC B	ESC B	ESC B
Conversation Mode On	**ESC C**	ESC C	ESC C	ESC C	ESC C
Full Duplex	**ESC D F**	**ESC D F**	ESC D F	**ESC D F**	ESC D F
Half Duplex	**ESC D H**	**ESC D H**	ESC D H	**ESC D H**	ESC D H
Set Local Edit	---	---	ESC k 1	ESC k	ESC k
Set Duplex Edit	---	---	ESC k 0	ESC l	ESC l
Protect Mode On	**ESC &**	ESC &	ESC &	ESC &	ESC &
Protect Mode Off	**ESC '**	ESC '	ESC '	ESC '	ESC '
Write Protect On	**ESC)**	ESC)	ESC)	ESC)	ESC)
Write Protect Off	**ESC (**	ESC (	ESC (	ESC (	ESC (
Graphics Mode On	**ESC $**	**ESC $**	ESC $	**ESC $**	ESC $
Graphics Mode Off	**ESC %**	**ESC %**	ESC %	**ESC %**	ESC %
Monitor Mode On	ESC U	**ESC U**	ESC U	ESC U	ESC U
	CTRL/1	**CTRL/1**	**CTRL/1**	**CTRL/1**	**CTRL/1**
Monitor Mode Off	ESC u	**ESC u**	**ESC u**	ESC u	ESC u
	ESC X	**ESC X**	ESC X	ESC X	ESC X
	CTRL/2	**CTRL/2**	**CTRL/2**	**CTRL/2**	**CTRL/2**
Special Functions					
Load User Line	**ESC f**	**ESC f**	ESC f	ESC f	ESC f
Display User Line	**ESC g**	**ESC g**	ESC s 1	ESC g	ESC g
Blank User Line	**ESC h**	**ESC h**	ESC s 2	ESC h	ESC h
Display Control Character	ESC F	**ESC F**	---	**ESC F**	**ESC F**
Load Default Setup	---	---	ESC ~ 0	---	---
Load Saved Setup	---	---	ESC ~ 1	---	---
Establish Setup Values	---	---	ESC }	---	---
Report from Setup	---	---	ESC Z 2	---	---
Enter Host Mssg Line	---	---	---	---	---

Mode Control	A210	VP-A1	VP-A2	H1500	WY-50
Block Mode On	ESC B	ESC B	ESC B	ESC B	ESC B
Conversation Mode On	ESC C	ESC C	ESC C	ESC C	ESC C
Full Duplex	ESC D F	ESC D F	ESC D F	ESC D F	ESC D F
Half Duplex	ESC D H	ESC D H	ESC D H	ESC D H	ESC D H
Set Local Edit	ESC k	---	---	---	---
Set Duplex Edit	ESC l	---	---	---	---
Protect Mode On	ESC &	ESC &	ESC &	---	ESC &
Protect Mode Off	ESC '	ESC '	ESC '	---	ESC '
Write Protect On	ESC)	ESC)	ESC)	~CTRL/Y	ESC)
Write Protect Off	ESC (	ESC (	ESC (	~CTRL/_	ESC (
Graphics Mode On	ESC $	ESC H STX	ESC H STX	ESC $	ESC H STX
Graphics Mode Off	ESC %	ESC H ETX	ESC H ETX	ESC %	ESC H ETX
Monitor Mode On	ESC U	ESC U	ESC U	ESC U	ESC U
	CTRL/1	CTRL/1	CTRL/1	CTRL/1	CTRL/1
Monitor Mode Off	ESC u	ESC u	ESC u	ESC u	ESC u
	ESC X	ESC X	ESC X	ESC X	ESC X
	CTRL/2	CTRL/2	CTRL/2	CTRL/2	CTRL/2
Special Functions					
Load User Line	ESC f	---	---	ESC f	---
Display User Line	ESC g	---	---	ESC g	---
Blank User Line	ESC h	---	---	ESC h	---
Display Control Character	ESC F	---	---	ESC F	---
Load Default Setup	---	---	---	---	---
Load Saved Setup	---	---	---	---	---
Establish Setup Values	---	---	---	---	---
Report from Setup	---	---	---	---	---
Enter Host Mssg Line	---	ESC F	ESC F	---	ESC F

Program'g Functions	TV910	TV920	TV924	TV925	TV950
Program Field Terminator	**ESC x 0**	**ESC x 0**	---	**ESC x 0**	ESC x 0
Program Line Terminator	**ESC x 1**	**ESC x 1**	---	**ESC x 1**	ESC x 1
Program Start Prot. Term.	**ESC x 2**	**ESC x 2**	---	**ESC x 2**	ESC x 2
Program End Prot. Term.	**ESC x 3**	**ESC x 3**	---	**ESC x 3**	ESC x 3
Program Page Term.	**ESC x 4**	**ESC x 4**	---	**ESC x 4**	ESC x 4
Program Delimiter Code	---	---	ESC x	---	---
Configure Host Port	---	---	ESC { 0	---	ESC {
Configure Aux. Port	---	---	ESC { 1	---	ESC }
Program One Edit Key	**ESC 0**	**ESC 0**	ESC 0	**ESC 0**	**ESC 0**
Program All Edit K's (Uns)	**ESC ^ 0**	**ESC] 0**	ESC] 0	**ESC ^ 0**	**ESC] 0**
Program All Edit K's (Sh)	**ESC ^ 1**	**ESC] 1**	ESC] 1	**ESC ^ 1**	**ESC] 1**
Program a Function Key	**ESC |**	**ESC |**	ESC |	**ESC |**	ESC |
Program Send Key (Uns)	---	---	---	---	ESC 0 1
Program Send Key (Sh)	---	---	---	---	ESC 0 2
Enter Function Key Label	---	---	---	---	---
Enter STX Character	---	---	---	---	---
Enter ETX Character	---	---	---	---	---
Program Print Term.	---	---	---	ESC p	---
Cursor Attributes					
Flashing Block Cursor	**ESC a 1**	**ESC . 1**	ESC . 1	ESC . 1	ESC . 1
Steady Block Cursor	**ESC a 2**	**ESC . 2**	ESC . 2	ESC . 2	ESC . 2
Flashing Underline Crsr	**ESC a 3**	**ESC . 3**	ESC . 3	ESC . 3	ESC . 3
Steady Underline Cursor	**ESC a 4**	**ESC . 4**	ESC . 4	ESC . 4	ESC . 4
Cursor on	---	---	---	---	---
Cursor off	**ESC a 0**	**ESC . 0**	ESC . 0	ESC . 0	ESC . 0
Cursor Visible/Invisible	ESC .	---	---	---	---

Program'g Functions	A210	VP-A1	VP-A2	H15000	WY-50
Program Field Terminator	ESC x 0	---	---	---	---
Program Line Terminator	ESC x 1	---	---	---	---
Program Start Prot. Term.	ESC x 2	---	---	---	---
Program End Prot, Term.	ESC x 3	---	---	---	---
Program Page Term.	ESC x 4	---	---	---	---
Program Delimiter Code	---	---	---	---	---
Configure Host Port	---	---	---	---	---
Configure Aux. Port	---	---	---	---	---
Program One Edit Key	ESC 0	ESC c	ESC c	ESC 0	ESC c
Program All Edit K's (Uns)	ESC ^ 0	ESC ^ 0	ESC ^ 0	ESC] 0	ESC ^ 0
Program All Edit K's (Sh)	ESC ^ 1	ESC ^ 1	ESC ^ 1	ESC] 1	ESC ^ 1
Program a Function Key	ESC |	ESC z	ESC z	ESC |	ESC z
Program Send Key (Uns)	---	---	---	---	---
Program Send Key (Sh)	---	---	---	---	---
Enter Function Key Label	---	ESC z	ESC z	---	ESC z
Enter STX Character	---	ESC 8	ESC 8	---	ESC 8
Enter ETX Character	---	ESC 9	ESC 9	---	ESC 9
Program Print Term.	---	---	---	---	---
Cursor Attributes					
Flashing Block Cursor	ESC . 1	ESC ' 5	ESC ' 5	ESC . 1	ESC ' 5
Steady Block Cursor	ESC . 2	ESC ' 2	ESC ' 2	ESC . 2	ESC ' 2
Flashing Underline Crsr	ESC . 3	ESC ' 3	ESC ' 3	ESC . 3	ESC ' 3
Steady Underline Cursor	ESC . 4	ESC ' 4	ESC ' 4	ESC . 4	ESC ' 4
Cursor on	---	ESC ' 1	ESC ' 1	---	ESC ' 1
		CTRL/X	CTRL/X		
Cursor off	ESC . 0	ESC ' 0	ESC ' 0	ESC . 0	ESC ' 0
		CTRL/W	CTRL/W		
Cursor Visible/Invisible	---	---	---	---	---

Terminal Control	TV910	TV920	TV924	TV925	TV950
Smooth Scroll On	**ESC 8**	**ESC 8**	ESC 8 1	ESC 8	ESC 8
Jump Scroll On	**ESC 9**	**ESC 9**	ESC 8 0	ESC 9	ESC 9
Smooth Scroll 1 r/s	---	---	---	---	---
Smooth Scroll 2 r/s	---	---	---	---	---
Smooth Scroll 4 r/s	---	---	---	---	---
Smooth Scroll 8 r/s	---	---	---	---	---
Scroll On/Off	ESC H	---	---	---	---
No scroll mode on	---	---	---	---	---
No scroll mode off	---	---	---	---	---
Flip mode on	---	**ESC v**	ESC v 1	ESC v	ESC v
Flip mode off	---	**ESC w**	ESC v 0	ESC w	ESC w
Set 24 line/page	---	---	ESC \ 1	---	ESC \ 1
Set 48 line/page	---	---	ESC \ 2	---	ESC \ 2
Set 96 line/page	---	---	ESC \ 3	---	ESC \ 3
(Go to) Previous page	---	**ESC J**	ESC J	ESC J	ESC J
(Go to) Next page	---	**ESC K**	ESC K	ESC K	ESC K
80 column Mode	**ESC . 5**	**ESC . 5**	**ESC . 5**	**ESC . 5**	**ESC . 5**
132 column mode	**ESC . 6**	**ESC . 6**	**ESC . 6**	**ESC . 6**	**ESC . 6**
Set Split screen	**ESC _**	**ESC _**	ESC _	**ESC _**	**ESC _**
Reset Split screen	---	---	---	---	---
Line Lock	---	---	---	---	ESC ! 1
Clear all line lock	---	---	---	---	ESC ! 2
Lock Keyboard	ESC #	ESC #	ESC #	ESC #	ESC #
Unlock Keyboard	ESC "	ESC "	ESC "	ESC "	ESC "
Key Click On	**ESC >**	**ESC >**	ESC < 1	ESC >	ESC >
Key Click Off	**ESC <**	**ESC<**	ESC < 0	ESC <	ESC <
Bell	CTRL/G	CTRL/G	CTRL/G	CTRL/G	CTRL/G
Start Self Test	ESC V	---	ESC V	---	---
Load/Read Time	---	---	---	ESC (sp)	---

Terminal Control	A210	VP-A1	VP-A2	H1500	WY-50
Smooth Scroll On	ESC 8	---	---	ESC 8	---
Jump Scroll On	ESC 9	ESC '@	ESC '@	ESC 9	ESC ' @
Smooth Scroll 1 r/s	---	ESC '<	ESC '<	---	ESC ' <
Smooth Scroll 2 r/s	---	ESC '=	ESC '=	---	ESC ' =
Smooth Scroll 4 r/s	---	ESC '>	ESC '>	---	ESC ' >
Smooth Scroll 8 r/s	---	ESC '?	ESC '?	---	ESC ' ?
Scroll On/Off	ESC H	---	---	---	---
No scroll mode on	---	ESC N	ESC N	---	ESC N
No scroll mode off	---	ESC O	ESC O	---	ESC O
Flip mode on	---	---	---	---	---
Flip mode off	---	---	---	---	---
Set 24 line/page	---	---	---	---	---
Set 48 line/page	---	---	---	---	---
Set 96 line/page	---	---	---	---	---
(Go to) Previous page	---	---	---	---	---
(Go to) Next page	---	---	---	---	---
80 column Mode	ESC . 5	ESC ':	ESC ':	ESC . 5	ESC ':
132 column mode	ESC . 6	ESC ';	ESC ';	ESC . 6	ESC ';
Set Split screen	ESC _	ESC x 1	ESC x 1	ESC _	ESC x 1
Reset Split screen	---	ESC x 0	ESC x 0	---	ESC x 0
Line Lock	---	---	---	---	---
Clear all line lock	---	---	---	---	---
Lock Keyboard	ESC #	ESC 5	ESC 5	~CTRL/U	ESC #
		CTRL/D	CTRL/D		CTRL/O
Unlock Keyboard	ESC "	ESC 6	ESC 6	~CTRL/F	ESC "
		CTRL/B	CTRL/B		CTRL/N
Key Click On	ESC >	ESC >	ESC >	ESC >	ESC >
Key Clock Off	ESC <	ESC<	ESC <	ESC <	ESC <
Bell	CTRL/G	CTRL/G	CTRL/G	CTRL/G	CTRL/G
Start Self Test	ESC V	---	---	---	---
Load/Read Time	ESC (sp)	---	---	---	---

Transmission to Host	TV910	TV920	TV924	TV925	TV950
Enable XON/XOFF	---	---	CTRL/O	CTRL/O	CTRL/O
Disable XON/XOFF	---	---	CTRL/N	CTRL/N	CTRL/N
Return ACKnowledge	---	---	---	---	---
Send Line Unprotect	**ESC 4**	ESC 4	ESC S 1	ESC 4	ESC 4
Send Line Protect	---	---	ESC S 2	---	---
Send Page Unprotect	**ESC 5**	ESC 5	ESC S 5	ESC 5	ESC 5
Send Page Protect	---	---	ESC S 6	---	---
Send Line All	**ESC 6**	ESC 6	ESC S 3	ESC 6	ESC 6
Send Page All	**ESC 7**	ESC 7	ESC S 7	ESC 7	ESC 7
Send Message Unprotect	**ESC S**	ESC S	ESC S 9	ESC S	ESC S
Send Message Protect	---	---	ESC S :	---	---
Send Message All	**ESC s**	ESC s	ESC S ;	ESC s	ESC s
Send Form	---	---	ESC S ?	---	---
Send Status Line	**ESC Z 1**	**ESC Z 1**	ESC Z 1	**ESC Z 1**	ESC Z 1
Send User Line	**ESC Z 0**	**ESC Z 0**	ESC Z 0	**ESC Z 0**	ESC Z 0
Send Terminal ID	**ESC M**	**ESC M**	ESC M	**ESC M**	ESC M
Send Config. to Host	---	---	ESC p 0	---	---
Send Non-volatile to Host	---	---	ESC p 1	---	---
Send Ansrbk Code	---	---	ESC ^ 0	---	---
Change Ansrbk Code	---	---	ESC ^ 1	---	---
Send Character	---	---	---	---	---
Transmit to Printer					
Local Print	**ESC P**	ESC P	ESC P 3	ESC P	ESC P
Exten'n Print (CCP) On	ESC @	ESC @	ESC @	ESC @	ESC @
Exten'n Print (CCP) Off	ESC A	ESC A	ESC A	ESC A	ESC A
Transp't Print (TPR) On	CTRL/R	**ESC `**	ESC `	ESC `	ESC `
Transp't Print (TPR) Off	CTRL/T	**ESC a**	ESC a	ESC a	ESC a
Bidirectional Print On	---	---	CTRL/R	CTRL/R	CTRL/R
Bidirectional Print Off	---	---	CTRL/T	CTRL/T	CTRL/T
Print Time and Text	---	---	---	ESC L	---
Print unformatted	**ESC L**	**ESC L**	ESC P 4	---	ESC L
Print unprotect	---	---	ESC P 1	---	---
Print protect	---	---	ESC P 2	---	---

Transmission to Host	A210	VP-A1	VP-A2	H1500	WY-50
Enable XON/XOFF	CTRL/O	---	---	---	---
Disable XON/XOFF	CTRL/N	---	---	---	---
Return ACKnowledge	---	CTRL/E	CTRL/E	---	CTRL/E
Send Line Unprotect	ESC 4	---	---	ESC 4	ESC 4
Send Line Protect	---	---	---	---	---
Send Page Unprotect	ESC 5	---	---	ESC 5	ESC 5
Send Page Protect	---	---	---	---	---
Send Line All	ESC 6	---	---	ESC 6	ESC 6
Send Page All	ESC 7	ESC 7	ESC 7	ESC 7	ESC 7
Send Message Unprotect	ESC S	ESC S	ESC S	ESC S	ESC S
Send Message Protect	---	---	---	---	---
Send Message All	ESC s	ESC s	ESC s	ESC s	ESC s
Send Form	---	---	---	---	---
Send Status Line	ESC Z 1	---	---	ESC Z 1	---
Send User Line	ESC Z 0	---	---	ESC Z 0	---
Send Terminal ID	CTRL/E	ESC (sp)	ESC (sp)	ESC M	ESC (sp)
Send Config. to Host	---	---	---	---	---
Send Non-volatile to Host	---	---	---	---	---
Send Ansrbk Code	---	---	---	---	---
Change Ansrbk Code	---	---	---	---	---
Send Character	---	---	---	---	ESC M

Transmit to Printer	A210	VP-A1	VP-A2	H1500	WY-50
Local Print	ESC P	ESC P	ESC P	ESC P	ESC P
Exten'n Print (CCP) On	ESC @	CTRL/R	CTRL/R	ESC @	CTRL/R
Exten'n Print (CCP) Off	ESC A	CTRL/T	CTRL/T	ESC A	CTRL/T
Transp't Print (TPR) On	ESC `	ESC 3	ESC 3	ESC `	CTRL/X
Transp't Print (TPR) Off	ESC a	ESC 4	ESC 4	ESC a	CTRL/T
Bidirectional Print On	CTRL/R	---	---	---	---
Bidirectional Print Off	CTRL/T	---	---	---	---
Print Time and Text	ESC L	---	---	---	---
Print unformatted	---	ESC L	ESC L	ESC L	ESC L
		ESC p	ESC p		ESC p
Print unprotect	---	ESC @	ESC @	---	ESC @
Print protect	---	---	---	---	---

ASCII CODE CHART

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

32 ASCII Control Codes

96 ASCII Character Set

For example,

Character	Binary (by bit)	Hexadecimal		Decimal
	87654321	Col	Row	
A	*1000001	4	1	65

APPENDIX F

Differences in ASCII Codes
National Character Set

HEX CODE	23	24	40	5B	5C	5D	5E	60	7B	7C	7D	7E
ASCII (App'x E)	#	$	@	[	\	]	^	`	{	|	}	~
Danish	#	$	@	Æ	ø	Å	^	`	æ	ø	å	~
English (U.K.)	£	$	@	[	\	]	^	`	{	|	}	~
French (Azerty)	£	$	à	°	Ç	§	^	`	é	ù	è	¨
German	#	$	§	Ä	Ö	Ü	^	`	ä	ö	ü	ß
Italian	£	$	§	°	Ç	é	^	ù	à	ò	è	ì
Norwegian	#	$	@	Æ	Ø	Å	^	`	æ	ø	å	~
Spanish	#	$	@	¡	Ñ	¿	^	`	{	ñ	}	~
Swedish	#	¤	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü

APPENDIX G

ASCII CODES FOR ROW/COLUMN NUMBERS

Certain programming tasks on the terminal, e.g., positioning the cursor, require you to identify in ASCII the number of a row and/or column on the screen. The following table lists this correspondence.

NOTE: for the native mode and for all emulations, when addressing the cursor to row and column (ESC =), column numbers above 80 are preceded by the lead-in code: CTRL/Z. For example,

Number (Decimal)	ASCII Character (from table)	In program line
2	!	!
82	!	CTRL/Z !

NOTE: for the native mode and for all emulations, when addressing the cursor to a column (ESC]), column numbers above 80 are preceded by the lead-in code: Z. For example,

Number (Decimal)	ASCII Character (from table)	In program line
2	!	!
82	!	Z !

Decimal	ASCII	Decimal	ASCII	Decimal	ASCII	Decimal	ASCII	Decimal	ASCII
1, 81	(space)	17, 97	0	33, 113	@	49, 129	P	65	`
2, 82	!	18, 98	1	34, 114	A	50, 130	Q	66	a
3, 83	"	19, 99	2	35, 115	B	51, 131	R	67	b
4, 84	#	20, 100	3	36, 116	C	52, 132	S	68	c
5, 85	$	21, 101	4	37, 117	D	53	T	69	d
6, 86	%	22, 102	5	38, 118	E	54	U	70	e
7, 87	&	23, 103	6	39, 119	F	55	V	71	f
8, 88	'	24, 104	7	40, 120	G	56	W	72	g
9, 89	(	25, 105	8	41, 121	H	57	X	73	h
10, 90	)	26, 106	9	42, 122	I	58	Y	74	i
11, 91	*	27, 107	:	43, 123	J	59	Z	75	j
12, 92	+	28, 108	;	44, 124	K	60	[	76	k
13, 93	,	29, 109	<	45, 125	L	61	\	77	l
14, 94	-	30, 110	=	46, 126	M	62	]	78	m
15, 95	.	31, 111	>	47, 127	N	63	^	79	n
16, 96	/	32, 112	?	48, 128	O	64	_	80	o

10s / 1s	0	1	2	3	4	5	6	7
1	NUL	DLE	SP	0	@	P	`	p
2	SOH	DC1	!	1	A	Q	a	q
3	STX	DC2	"	2	B	R	b	r
4	ETX	DC3	#	3	C	S	c	s
5	EOT	DC4	$	4	D	T	d	t
6	ENQ	NAK	%	5	E	U	e	u
7	ACK	SYN	&	6	F	V	f	v
8	BEL	ETB	'	7	G	W	g	w
9	BS	CAN	(	8	H	X	h	x
10	HT	EM	)	9	I	Y	i	y

In certain emulations, e.g., Ampex 210, the cursor can be moved by column only. Use the table above to identify the ASCII code for the desired column.

For example, the ASCII code for column 42 is A: read down column 4, read across row 2.

APPENDIX H

MONITOR MODE SYMBOLS

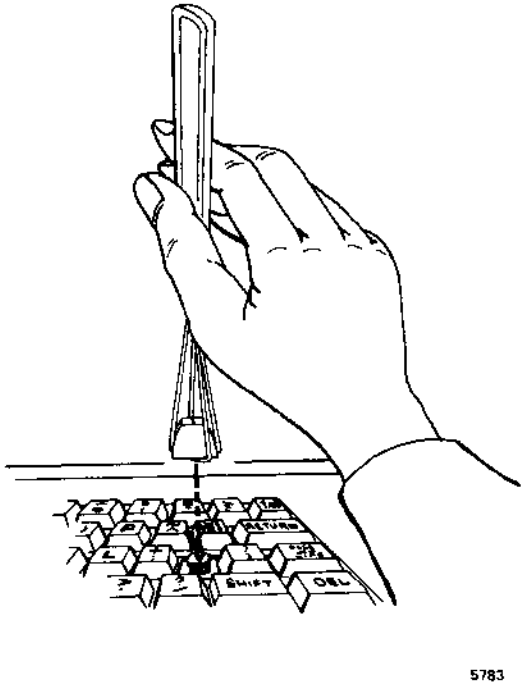
Fascimile	ASCII	Hex Code	Description
N_U	NUL	00	Null
S_H	SOH	01	Start of Heading
S_X	STX	02	Start of Text
E_X	ETX	03	End of Text
E_T	EOT	04	End of Transmission
E_Q	ENQ	05	Enquiry
A_C	ACK	06	Acknowledge
B_L	BEL	07	Bell (beep)
B_S	BS	08	Back Space
H_T	HT	09	Horizontal Tab
L_F	LF	0A	Line Fee
V_T	VT	0B	Vertical Tab
F_F	FF	0C	Form Feed
C_R	CR	0D	Carriage Return
S_O	SO	0E	Shift Out
S_I	SI	0F	Shift In
D_L	DLE	10	Data Link Escape
D_1	DC1	11	Device Control 1
D_2	DC2	12	Device Control 2
D_3	DC3	13	Device Control 3
D_4	DC4	14	Device Control 4
N_K	NAK	15	Negative Acknowledge
S_N	SYN	16	Synchronous Idle
E_B	ETB	17	End of Transmission Block
C_N	CAN	18	Cancel
E_M	EM	19	End of Medium
S_B	SUB	1A	Substitute (clear all to spaces)
E_S	ESC	1B	Escape
F_S	FS	1C	File Separator
G_S	GS	1D	Group Separator
R_S	RS	1E	Record Separator (Home)
U_S	US	1F	Unit Separator (New Line)

CHANGING KEYBOARD CHARACTER SET

Removing Keycaps

When installing one of the optional national character sets, remove and replace keycaps properly, using the keycap remover provided by Ampex (Part No. 074-297) or use an equivalent device (Figure Ins-1). For proper removal of keycaps, follow this procedure:

1. Turn the power "off" and disconnect the keyboard from the terminal.
2. Using the Keycap Remover (Figure Ins-1), gently place the tongs under the keycap.
3. Twist the Keycap Remover forty-five degrees to the right so that the handle is pointing diagonally.
4. Carefully lift up on the keycap until it snaps out of place.
5. Remove the keycap from the tongs. Make sure that the yellow plunger is still in place on the keyboard (see Figure Ins-2). If the yellow plunger was removed with the keycap, follow the procedure below to re-insert the plunger.



5783

Figure Ins-1. Keycap Remover

Replacing the Yellow Plunger

1. Using needle-nose pliers, remove the plunger from the keycap. Avoid damaging the plunger when separating it from the keycap.

2. Position the plunger over the keyswitch so that the bar on the underside of the plunger runs north/south, relative to the keyboard.

3. Carefully lower the plunger, making sure the bar separates the two contacts.

CAUTION

Inserting the yellow plunger improperly may bend or break the contacts of the key.

4. With the contacts separated by the bar on the plunger, press the plunger firmly into position.

5. Check the keyswitch to make sure it operates freely.

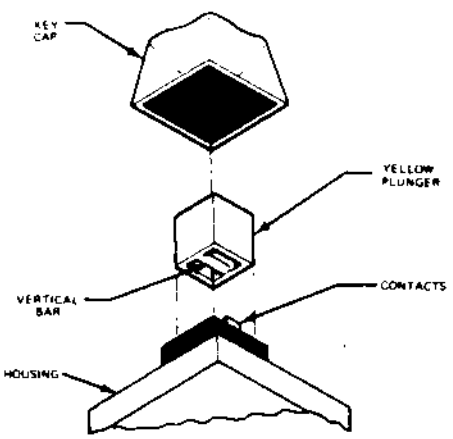


Figure Ins-2. Replacing Plunger

Replacing Keycaps

Position the replacement keycap over the correct key location. After doublechecking the keycap to be sure it is properly centered, depress the keycap until it is securely seated on the plunger.

Illustrations in Appendix B identify the correct key location for each character set.