MODEL 924

VIDEO DISPLAY TERMINAL

USER'S GUIDE

MODEL 924 VIDEO DISPLAY TERMINAL
USER'S GUIDE

MANUAL REVISION HISTORY

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ABOUT THIS MANUAL

Introduction

This manual provides information about the Texas Instruments Model 924 Video Display Terminal and its use with Texas Instruments computers. It is intended for both end users and programmers.

If you are using the 924 VDT as a terminal on a Business System computer, you should review the material in the first five chapters and then proceed to Section 5, Set-Up, to customize the terminal's operating features for your preferences.

If you intend to program the 924 VDT, review the information in the first six chapters and then refer to Section 7, Programming, and the appendixes.

Organization of This Manual

This manual is divided into seven chapters and seven appendixes, as follows:

Section 1: General Information — Provides an overview of the Model 924 VDT and lists features and specifications.

Section 2: Installation — Explains how to unpack and install the Model 924 VDT.

Section 3: Operation — Describes the operation of the Model 924 VDT.

Section 4: Configuration — Explains how to configure the Model 924 VDT to work with TI computer systems.

Section 5: Set-Up — Describes the set-up procedures for the Model 924 VDT.

Section 6: Communication Environment — Provides information on host and printer port interfaces, modem requirements, data flow control, and other communications requirements.

Section 7: Programming — Intended for programmers, this section describes the 924 VDT's graphic repertoire. It also discusses the keyboard codes and how the 924 VDT processes received characters. At the end of the section is a discussion of the diagnostic procedures.

Appendix A: 924 Mode Transmitted Codes — Lists the codes transmitted by the U.S. keyboard and the numeric keypad calculator.

Appendix B: 924 Mode Codes and Functions — Provides several tables which outline the relationship between 924 keys, control functions, and keyboard compatibilities.

Appendix C: Receive Codes — Lists the control codes and sequences recognized by the 924 VDT when in 924, 931, and VT100 modes.

Appendix D: 931 Mode Transmitted Codes — Lists the codes transmitted by the keyboard when the terminal is in 931 mode.

Appendix E: 924 Kits for Business Systems — Lists the part numbers for the cables and kits required to connect the 924 VDT to a Business System computer.

Appendix F: 924 Mode Received and Recognized Codes — Lists 924 received codes, recognized C1 control codes and ISO/ANSI sequences, and ISO/ANSI modes supported.

Appendix G: 924 VDT Emulation of 931 VDT — Describes the operating and programming differences between the 931 VDT and the 924 VDT in 931 Emulation mode.

Additional Documentation

The Texas Instruments Model 924 VDT is designed to interface with several TI computer systems. Therefore, this manual does not give specific information on any one host computer. Refer to the documentation for your system for additional information.

For information on operating the 924 VDT in 931 emulation mode, refer to the *Model 931 Video Display Terminal General Description*, TI part number 2229228-0001.

GENERAL INFORMATION 1
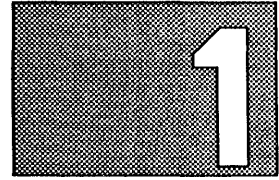
Introduction

1.1 This section describes the major features and specifications of the Texas Instruments Model 924 Video Display Terminal (VDT). The Model 924 VDT is a state-of-the-art terminal designed to interface with the Texas Instruments System 1000 series, System 300/600/800, and BUSINESS-PRO™ computer. The terminal, shown in Figure 1-1, consists of a video display unit (VDU) and a separate keyboard. It communicates with the host computer by means of a communications interface and cable.

Figure 1-1 **Texas Instruments Model 924 Video Display Terminal**
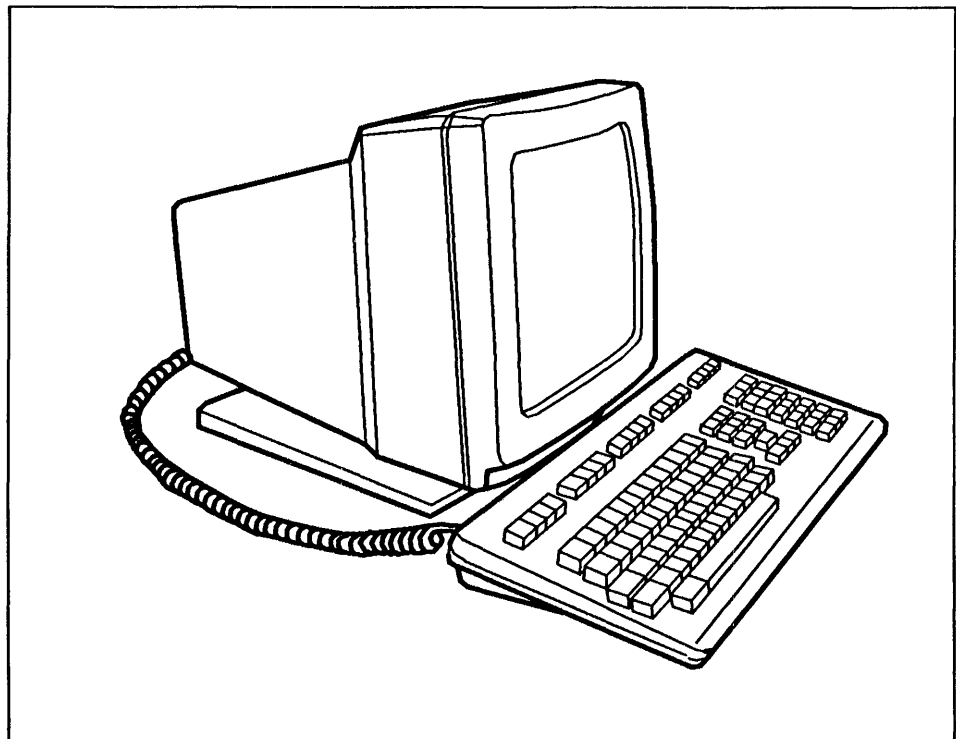
The components of the VDU include a monochrome cathode ray tube (CRT), a terminal controller board, and a power supply and monitor controller board.

The low-profile keyboard has a main keypad with a standard typewriter arrangement, a 10-key keypad, and top row keys labeled F1 through F12.

Self-testing capability is built into the 924 VDT to verify proper operation every time power is applied to the VDT.

BUSINESS-PRO is a trademark of Texas Instruments Incorporated.

The Model 924 VDT is a system terminal intended for online operation. Off-line, it can be physically connected to a host system but it neither transmits nor receives data. Keyboard input is copied only to the screen.

The terminal drives a printer that can be activated by the host through the terminal while the operator at the terminal retains full use of the VDT.

The VDU and keyboard can be placed on a desk or table for convenient operation.

Table 1-1 briefly describes the features of the Model 924 VDT.

Table 1-1   **Model 924 VDT Features and Specifications**

Feature	Description
Keyboard	Detached, low-profile, adjustable tilt
	Standard typewriter layout
	Acoustic feedback
	Calculator-style numeric keypad
Display	Adjustable-tilt video display unit
	14-inch (diagonal measure) cathode ray tube
	10 × 14 character cell
	80 columns or 132 columns by 24 rows
	Reverse video
	Highlight
	Underline
	Blink
Character sets	ASCII, UK National, special graphic, multi-national (94 characters each), and a user-definable downloaded set
Cursor attributes	Blinking underline
	Stable underline
	Blinking block character
	Stable block character
Voltage input 120 Vac (nominal)	90 to 130 Vac
Voltage input 220–240 Vac (nominal)	180 to 260 Vac
Power input (maximum)	40 watts
Frequency	47 to 63 Hertz
Ambient temperature (storage)	−40 degrees C to + 65 degrees C (−40 degrees F to +149 degrees F)

Table 1-1	Model 924 VDT Features and Specifications (Continued)	
Feature	**Description**	
Ambient temperature (operating)	+10 degrees C to +40 degrees C (+50 degrees F to +104 degrees F)	
Relative humidity (storage)	5% to 95% (noncondensing)	
Relative humidity (operating)	15% to 80% (noncondensing)	
Altitude	−300 to 3000 meters (−984 to 9843 feet)	

INSTALLATION 2

Introduction

2.1 This section provides instructions for unpacking and installing the Model 924 VDT.

Unpacking the Model 924 VDT

2.2 Perform the following steps to unpack the VDT.

1. Inspect the shipping container for damage. Report any container damage to the shipping agent.

2. Be sure the shipping container is upright. Remove all straps securing the shipping container.

3. Using a sharp knife, carefully cut the tape securing the flaps on the top of the container and open the flaps.

4. Carefully remove the fitted foam top piece covering the VDT. Save the shipping container and all packing materials in case the VDT must be shipped again.

5. In the fitted foam bottom piece you should find the VDU, a keyboard, a coiled keyboard cable, a power cable, and the *Model 924 Video Display Terminal User's Guide*.

6. Carefully inspect the keyboard, VDT, and cables for shipping damage.

WARNING: If the CRT is broken, do not touch any part of it, as the inner coating is poisonous.

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7. Note any damage and follow local procedures for handling damaged shipments.

CAUTION: If the VDT is damaged, contact your dealer or qualified Customer Representative to correct the problem before applying power to the unit.

Installing the VDT

2.3 Perform the following steps to install the VDT. Refer to Figure 2-1 for the location of the connectors.

1. Plug the keyboard cable into the connector on the back of the VDT.

2. Connect the VDT to a computer system and a printer, following the instructions supplied with your computer and printer.

3. Plug the power cord into both the VDT and the wall outlet.

4. Turn on the VDT and watch for the following message to appear:

   Model 924 OK

VDT Connectors

2.4 The following list describes the VDT connectors, which are shown in Figure 2-1.

■ The RS-232C host port connector is used to connect the VDT to a host computer, either directly or through a modem.

■ The printer port connector is used to connect a printer to the VDT.

■ The ac power input connector is used to connect the power cord at the VDT. The power source for the 115-volt VDT is a standard wall outlet. The power source for the 220-volt VDT is a 220-volt outlet.

■ The keyboard connector is used to connect the keyboard to the VDT.

Figure 2-1   **Model 924 VDT Connectors**

AC Power Input

Keyboard Cable Connector

Printer Port Connector

RS-232C Host Port Connector
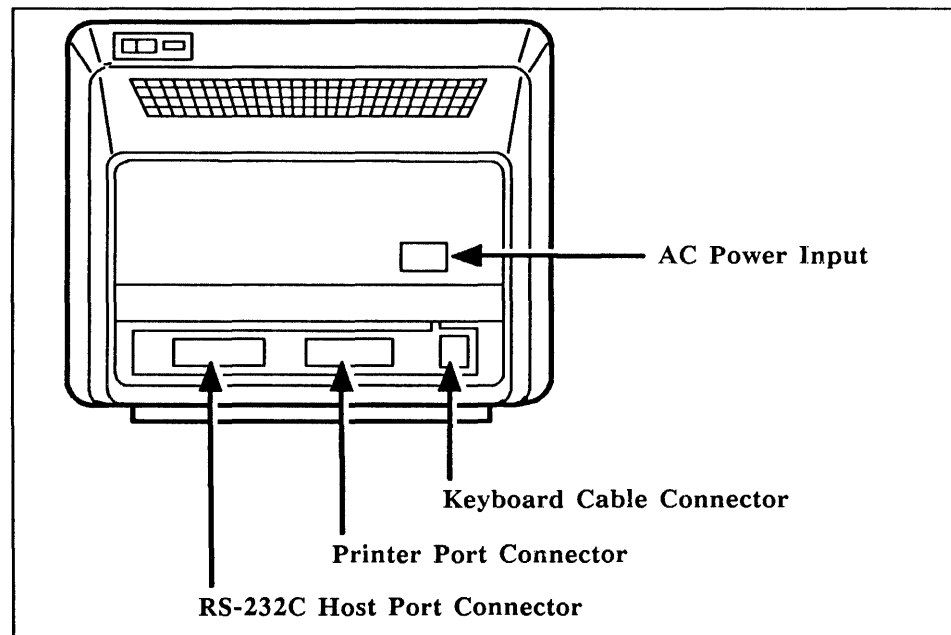
OPERATION

Introduction

3.1 This section describes the operation of the Model 924 VDT, including the following:

- ■ VDT controls and indicators

- ■ The keyboard

- ■ Character compose sequences

- ■ Printing

- ■ Self-test error messages

The Model 924 VDT offers a wide range of operating characteristics, many of which can be changed or customized to meet your requirements. This section describes some of these characteristics and lists the available options. To make the changes, you must enter Set-Up, which is a term used to describe a series of screens on which you indicate your preferences. The procedure for entering set-up and making your changes is described in detail in Section 5.

A complete list of operating features is provided in Section 4.

VDT Controls

3.2 The following list describes the VDT controls.

- ■ Power on/off switch — Press 1 on the power switch to turn the power on; press 0 on the power switch to turn the power off. This switch is shown in Figure 3-1.

- ■ Tilt and swivel base control — The tilt and swivel base changes the viewing angle of the VDU.

- ■ Brightness Control — The brightness control regulates screen brightness. This control is shown in Figure 3-1.

- ■ Contrast control — To change the contrast, enter set-up. (See Section 5, Set-Up.) To increase the contrast, press and hold the Shift key and press the Up Arrow key. To decrease the contrast, press and hold the Shift key and press the Down Arrow key.

Figure 3-1   **Model 924 VDT Controls**

Power On/Off Switch

Brightness Control
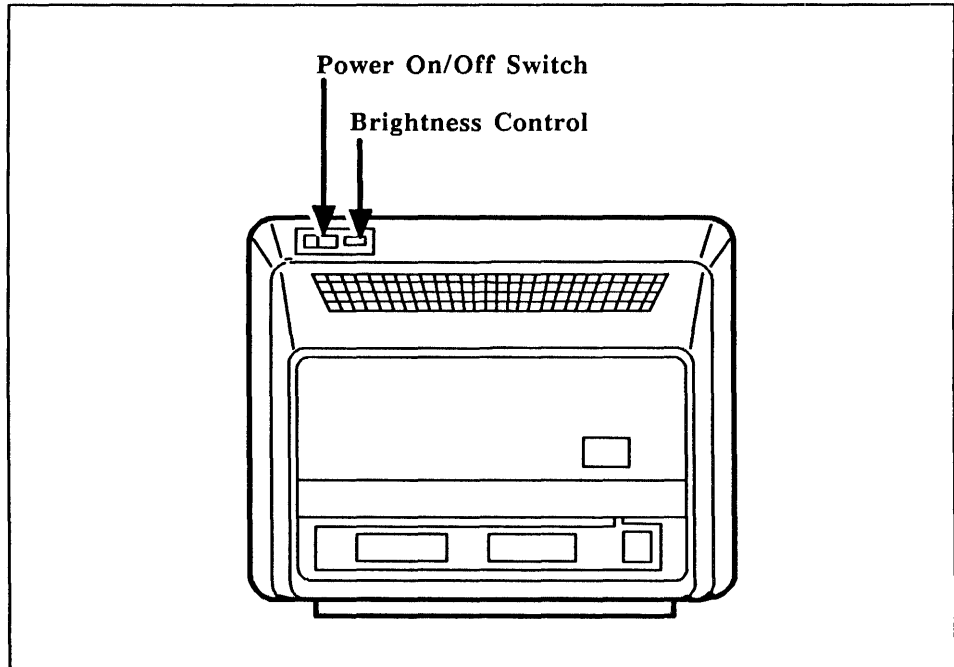
VDT Indicators   3.3   The following paragraphs describe the VDT indicators.

Cursor   **3.3.1** The cursor shows where the next character will be displayed on the screen. You can choose between a block or an underline cursor while in set-up, which is described in Section 5.

LED Indicators   **3.3.2** There are three LED indicators on the Model 924 VDT. These LEDs are described in the following list.

■ The caps lock indicator is located on the Caps Lock key, as shown in Figure 3-2. When lit, it specifies that the terminal will generate uppercase characters only.

■ The compose indicator is located on the Compose Character key, as shown in Figure 3-2. When lit, it shows that you are executing a compose sequence. Compose sequences are key combinations used to create characters not available on your keyboard. See paragraph 3.8, Composing Characters, in this section.

■ The power LED on the VDU indicates that power is applied to the unit.

Figure 3-2 North American Keyboard
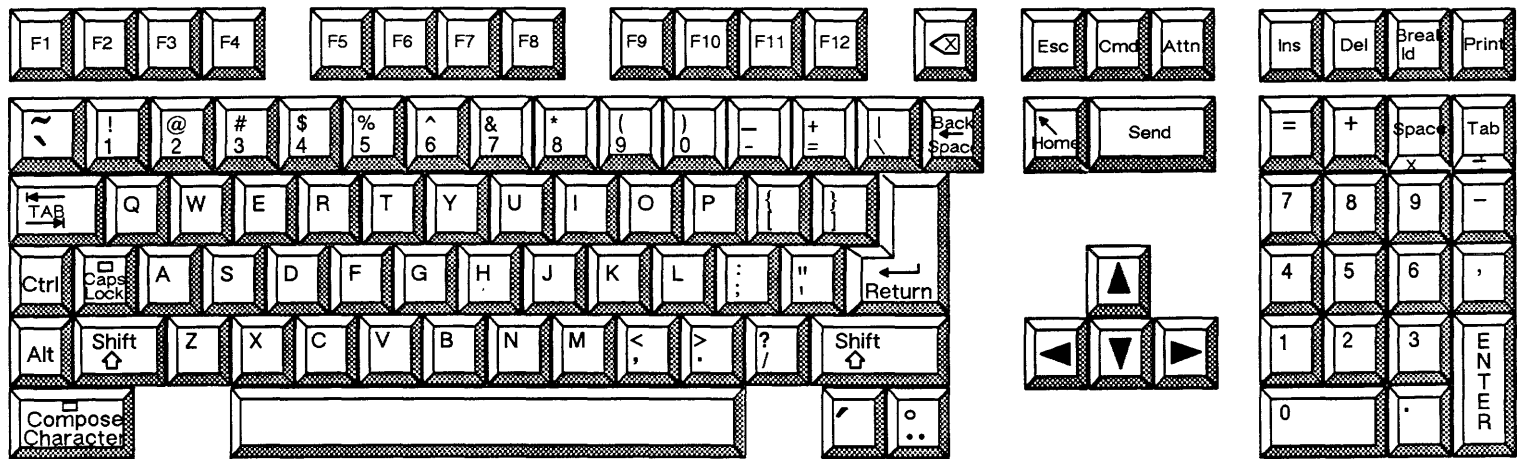
Acoustic Indicators   **3.3.3**   The acoustic indicators include a bell tone and key clicks. The following list describes the acoustic indicators on the Model 924 VDT.

■ Bell tone — During set-up, which is described in Section 5, you can turn the bell tone on or off. If the bell tone is turned on, it will sound in the following situations:

    ■ During the power-up self-test

    ■ When a bell character is sent from the computer to the keyboard

    ■ When an error occurs in a compose sequence

    ■ When the cursor nears the right margin

■ Key Click — A keyboard click is generated each time you press a key, unless the key click feature is turned off during set-up.

Alt, Shift, and Ctrl do not generate key clicks because they modify characters generated by other keys but do not generate any characters themselves.

Screen Saver   **3.4**   When there is no local (keyboard) processing or host communication operations for 30 minutes, the information on the screen is no longer displayed. However, the data is retained. The monitor is reactivated when it receives input from the host computer or when you press any key on the keyboard.

Keyboard Keys   **3.5**   The following paragraphs explain the functions performed by the keyboard keys.

Top Row Keys   **3.5.1**   There are twelve function keys on the top row of the keyboard. These keys are labeled F1 through F12; their function is defined by the application.

Additionally, there are eight top row keys that have keycap labels indicating their functions. These keys are described in the following table.

Key	Function
Backspace	Sends a key code that causes the host software to move the cursor one character position to the left.
Esc	Sends a key code that is normally used by application programs for a special purpose, such as return from interrupt.
Cmd	Sends a command key code to the host. The function of this key is defined by the application program. See the transmitted code tables in Appendix A to determine the action of the application program.

Key	Function
Attn	Sends an attention key code to the host. The function of this key is defined by the application program. See the transmitted code table in Appendix A to determine the action of the application program.
Ins	Sends a key code that causes the host software to insert a character at the cursor position.
Del	Sends a key code that causes the host software to erase one character to the left of the cursor.
Break Id	Transmits an answerback message if one has been previously stored. If Shift is pressed, the break function is transmitted. If Shift-Control is pressed, a disconnect is initiated.
Print	If the printer is not in print controller mode, the Print key sends the contents of the display screen to the local printer.

Main Keypad

3.5.2 The main keypad is the keypad that resembles a typewriter keyboard. It contains alphanumeric and character keys, as well as additional function keys. These function keys are described in the following table.

Key	Function
Tab	Transmits a horizontal tab that directs the cursor to the following tab stop.
Ctrl	The Ctrl key does not transmit a code. You must hold it down while pressing another key to send a control code to the computer that tells the system to execute a predefined task. Alternate key codes are listed in Appendix A.
Caps Lock	The Caps Lock key itself does not transmit a code. Press the Caps Lock key to generate only uppercase characters. Press the Caps Lock key again to generate only lowercase characters.
Alt (Alternate)	The Alt key does not transmit a code. You must hold it down while pressing the appropriate key to generate an alternate key function that tells the application to execute a predefined task. Alternate key codes are listed in Appendix A.
Shift	Hold down the Shift key and press the appropriate key to generate an uppercase character or the character shown on the top of keys with two characters.
	Sometimes the Shift key is pressed with another key to generate a predefined control function. For example, Shift-F2 means to press and hold the Shift key while pressing the F2 key.
Space Bar	Transmits an SP character.

Key	Function
Compose Character	The Compose Character key is used to create characters that do not exist on your keyboard. This key works only in 924 mode (see paragraph 3.7, Operating Modes). The Compose Character key does not transmit a code.
Backspace	Sends a key code that causes the software to erase one character to the left of the cursor.
Return	Generates either a carriage return (0/13), or a carriage return (0/13) and line feed (0/10), depending on the set/reset state of the Line Feed/New Line mode established at set-up.

Auxiliary Keys **3.5.3** The auxiliary keys consist of the character keys and control keys on the numeric keypad, the Home key, the Send key, and the arrow keys.

The numeric keypad functions like an adding machine. It is used to enter numeric data. The remaining auxiliary keys are explained in the following table.

Key	Function
Enter	Generates either a carriage return or a carriage return and line feed, depending on the Set/Reset state of the Line Feed/New Line mode established at set-up. In set-up, use the Enter key to activate a selected feature.
Space	Transmits a space code.
Tab	Transmits a tab code, sending the cursor to the next tab stop.
Home	Returns the cursor to the upper left corner of the screen.
Send	Causes communication applications to send a predefined message.
Arrow keys	The left and right arrow keys move the cursor one character position in the indicated direction. The up and down arrow keys move the cursor up or down one line.

Online and Offline Operation **3.6** The 924 VDT can be operated either online or offline.

The online state enables communication between the VDT and the host computer. When the VDT is online, data entered at the keyboard is transmitted to the host computer.

The offline state is used to disconnect the host computer. When the VDT is offline, data entered at the VDT keyboard is transmitted only to the VDT screen.

Operating Modes

3.7 The 924 VDT can operate in one of three operating modes. You can specify the operating mode while in set-up, which is described in Section 5, or from the host computer using control codes. The following list describes the operating modes:

■ 924 mode — The standard mode for the TI 924 VDT.

■ 931 mode — Emulates the Texas Instruments 931 terminal.

■ VT100 mode — Performs standard ANSI functions.

Composing Characters

3.8 You can create a number of characters in addition to those provided by the keyboard keys. Table 3-1 lists the characters you can create and the key combinations required to create these characters. Follow these steps:

1. Ensure that your terminal is in 924 VDT mode.

2. Press the Compose Character key. The Compose indicator lights to show that the terminal is in compose mode.

3. Type the two characters from the right-hand column in Table 3-1. For example, to create an A with a grave accent, press Compose Character, and then type A and a single quote. You could also press Compose Character, and then type a single quote and an A.

When you specify a diacritical mark in the compose sequence, the terminal treats the mark as if it were its equivalent character, defined as follows:

Diacritical Mark	Equivalent Character
Acute accent (´)	Apostrophe (')
Circumflex accent (ˆ)	Circumflex (ˆ)
Diaresis (umlaut) mark	Double quote (")
Grave accent (`)	Single quote (`)
Ring mark (°)	Asterisk (*) or degree sign (°)
Tilde mark (~)	Tilde (~)

When a correct compose operation ends, the compose indicator switches off and the application receives the character. When a compose sequence is invalid, the operation aborts and the bell sounds (if you enabled the bell in the keyboard set-up). The bell does not ring when you use the function keys to stop a compose sequence.

In Table 3-1, the notation (sp) indicates a space character.

Table 3-1	**Compose Sequences**

Character		Compose Sequence
"	(quotation mark)	"(sp)
#	(number sign)	++
'	(apostrophe)	'(sp)
@	(commercial at)	aa *or* AA
[	(opening bracket)	((
\	(backslash)	// *or* /<
]	(closing bracket)	))
^	(circumflex)	^(sp)
'	(single quote)	'(sp)
{	(opening brace)	(–
|	(vertical line)	/^
}	(closing brace)	)–
~	(tilde)	~ (sp)
¡	(inverted !)	!!
¢	(cent sign)	c/ *or* C/ *or* c *or* C
£	(pound sign)	l– *or* L– *or* l= *or* L=
¥	(yen sign)	y– *or* Y– *or* y= *or* Y=
§	(section sign)	so *or* SO *or* S! *or* s! *or* s0 *or* S0
¤	(currency sign)	xo *or* XO *or* x0 *or* X0
©	(copyright sign)	co *or* CO *or* c0 *or* C0
ª	(feminine ordinal indicator)	a– *or* A–
<<	(angle quotation mark left)	<<
°	(degree sign)	0^ *or* (sp)* *or* (sp)o
±	(plus/minus sign)	+
¹	(superscript 1)	1^
²	(superscript 2)	2^
³	(superscript 3)	3^

Table 3-1

Character		Compose Sequence
μ	(micro sign)	/u *or* /U (order sensitive)
¶	(paragraph sign)	p! *or* P!
>>	(angle quotation mark right)	>>
¼	(fraction one-quarter)	14 (order sensitive)
½	(fraction one-half)	12 (order sensitive)
¿	(inverted ?)	??
À	(A grave)	A `
Á	(A acute)	A'
Â	(A circumflex)	A^
Ã	(A tilde)	A-
Ä	(A umlaut)	A" *or* A ¨ (umlaut)
Å	(A ring)	A* *or* A°
Æ	(AE ligature)	AE (order sensitive)
Ç	(C cedilla)	C,
È	(E grave)	E `
É	(E acute)	E'
Ê	(E circumflex)	E^
Ë	(E umlaut)	E" *or* E ¨ (umlaut)
Ì	(I grave)	I `
Í	(I acute)	I'
Î	(I circumflex)	I^
Ï	(I umlaut)	I" *or* I ¨ (umlaut)
Ñ	(N tilde)	N-

Table 3-1

Compose Sequences (Continued)

Character		Compose Sequence
Ò	(O grave)	O `
Ó	(O acute)	O'
Ô	(O circumflex)	O^
Õ	(O tilde)	O~
Ö	(O umlaut)	O" *or* O ¨ (umlaut)
Œ	(O E ligature)	OE (order sensitive)
Ù	(u grave)	U `
Ú	(U acute)	U'
Û	(U circumflex)	U^
Ũ	(U tilde)	U~
Ü	(U umlaut)	U" *or* U ¨ (umlaut)
Ÿ	(Y umlaut)	Y" *or* Y ¨ (umlaut)
à	(a grave)	a `
á	(a acute)	a'
â	(a circumflex)	a^
ã	(a tilde)	a~
ä	(a umlaut)	a" *or* a ¨ (umlaut)
å	(a ring)	a* *or* a°
æ	(a e ligature)	ae (order sensitive)
ç	(c cedilla)	c, (comma)
è	(e grave)	e `
é	(e acute)	e'
ê	(e circumflex)	e^

Table 3-1

Compose Sequences (Continued)

Character		Compose Sequence
ë	(e umlaut)	e" *or* e ¨ (umlaut)
ì	(i grave)	i `
í	(i acute)	i'
î	(i circumflex)	i^
ï	(i umlaut)	i" *or* i ¨ (umlaut)
ñ	(n tilde)	n~
ò	(o grave)	o `
ó	(o acute)	o'
ô	(o circumflex)	o^
õ	(o tilde)	o~
ö	(o umlaut)	o" *or* o ¨ (umlaut)
œ	(o e ligature)	oe (order sensitive)
ø	(o slash)	o/
ù	(u grave)	u `
ú	(u acute)	u'
û	(u circumflex)	u^
ü	(u umlaut)	u" *or* u ¨ (umlaut)
ÿ	(y umlaut)	y" *or* y ¨ (umlaut)

Printing Modes   **3.9** The 924 VDT supports the following printing modes:

■ Normal mode (default)

■ Auto Print mode

■ Printer Controller mode

■ Local Controller mode

These printing modes are described in the following paragraphs.

Normal Mode   **3.9.1** In the normal print mode, you can invoke all keyboard printing functions (such as print screen) from the keyboard. Normal mode is the default setting.

Auto Print Mode   **3.9.2** Auto print mode causes the current display line to be printed when the cursor moves to the next line, which occurs when the terminal receives a line feed, form feed, or vertical tab code, or during auto wrap. When invoked, auto print mode is shown on the status line on the set-up screen. All keyboard printing functions (such as print screen) are allowed in this mode.

There are two ways to invoke this mode:

■ Enter set-up and change the mode setting on the Printer Set-Up screen.

■ Type Ctrl-F2. Type Ctrl-F2 again to exit auto print mode.

Print Controller   **3.9.3** In this mode, the host computer directs the printer. Characters received
Mode   from the host computer, except NUL, XON, XOFF, CSI 5 i, and CSI 4 i, are sent directly to the printer without appearing on the terminal.

To invoke and exit this mode, enter set-up and change the mode setting on the Printer Set-Up screen.

Local Controller   **3.9.4** Local controller mode is used to send keyboard output directly to the
Mode   printer. This mode is useful when setting up some printers without interfacing with the host computer.

Follow these steps to invoke Local Controller mode:

1. Enter set-up.

2. With the Set-Up directory displayed on your screen, select Local.

3. Proceed to the Printer Set-Up screen and select Printer Controller Mode.

**Self-Test
Error Messages**

3.10 Whenever the Model 924 VDT is powered up, it performs self-tests to verify proper operation. If an error is detected, one of the following messages is displayed:

- BATTERY FAILURE DETECTED — Indicates a failure of the battery used to power the nonvolatile memory.

- NON-VOLATILE RAM FAILURE DETECTED — Indicates a failure in the nonvolatile memory.

- PRINTER PORT FAILURE DETECTED — Indicates a failure in the interface to the local printer.

- HOST PORT FAILURE DETECTED — Indicates a failure in the interface to the host computer.

- KEYBOARD FAILURE DETECTED — Indicates a keyboard failure.

A barberpole test of the selected character set can be displayed on the VDU screen or sent to the local printer. All tests can be selected to operate continuously. Self-tests are described in Section 7.

CONFIGURATION

Introduction
4.1 This section describes the appropriate set-up choices to make for operating the 924 VDT with various Texas Instruments computer systems. The default settings are optimized for the S1500 systems. Certain application programs may require alternate settings for proper operation, and printer and communication set-up features must match the printer and host in use. Section 5 describes the entire set-up procedure.

Default Features
4.1.1 The following list shows the default set-up features. An asterisk (*) indicates that the feature can be changed to suit the user's preference.

Display Set-Up

Controls	Interpret Controls
Number of Columns	80 Columns*
Wrap	Auto Wrap*
Scroll	Smooth Scroll*
Text, Screen	Normal Video*
Cursor, No Cursor	Cursor*
Cursor Style	Block Cursor*
Cursor Blink	Steady*

General Set-Up

Mode	TI 924 Mode (7-bit controls)
User Features	User Features Unlocked
User Defined Keys	User Defined Keys Unlocked
New Line	No New Line
Keypad Field	Numeric Keypad

Communications Set-Up

Transmit	19200
Receive	Receive = Transmit
XOFF	XOFF at 128
Bits, Parity	7 Bits, Odd Parity
Stop Bit	1 Stop Bit
Local Echo	No Local Echo
Port	EIA Port, Modem Control
Disconnect, Delay	Disconnect, 2 second Delay
Transmit	Unlimited Transmit

Printer Set-Up

Speed	9600
Mode	Normal Printer Mode
Bits, Parity	7 Bits, Odd Parity
Stop Bit	1 Stop Bit
Print	Print Full Page
Print Data Type	ASCII/U.K.
Printer Terminator	No Terminator

Keyboard Set-Up

Break On, Off	Break
Auto Repeat	Auto Repeat*
Keyclick	No Keyclick*
Margin Bell	No Margin Bell*
Warning Bell	Warning Bell*
Auto Answerback	No Auto Answerback Function
Concealed	Not Concealed

990 System Features

4.1.2 This paragraph describes the set-up selections required to operate the 924 VDT with a 990 system. An asterisk (*) indicates that the feature can be changed to suit the user's preference.

Display Set-Up

Controls	Interpret Controls
Number of Columns	80 Columns*
Wrap	Auto Wrap*
Scroll	Jump Scroll*
Text, Screen	Normal Video*
Cursor, No Cursor	Cursor*
Cursor Style	Block Cursor*
Cursor Blink	Steady*

General Set-Up

Mode	TI 931 Mode, ASCII
User Features	User Features Unlocked
User Defined Keys	No Keyboard Protection
New Line	No New Line

Communications Set-Up

Transmit	19200
Receive	Receive = Transmit
XOFF	XOFF at 128
Bits, Parity	7 Bits, Odd Parity, No Check
Stop Bit	1 Stop Bit
Port	EIA Port, Modem Control
Disconnect, Delay	Disconnect, 2 second Delay
Transmit	Unlimited Transmit

Printer Set-Up

Speed	9600
Mode	Normal Printer Mode
Bits, Parity	7 Bits, Odd Parity
Stop Bit	1 Stop Bit
Print	Print Full Page
Print Data Type	ASCII/U.K.
Printer Terminator	No Terminator

Keyboard Set-Up

Break On, Off	Break
Auto Repeat	Auto Repeat*
Keyclick	No Keyclick*
Margin Bell	No Margin Bell*
Warning Bell	Warning Bell*
Auto Answerback	No Auto Answerback Function
Concealed	Not Concealed

BUSINESS-PRO Features

4.1.3 This paragraph describes the set-up selections required to operate the 924 VDT with a BUSINESS-PRO. An asterisk (*) indicates that the feature can be changed to suit the user's preference.

Display Set-Up

Controls	Interpret Controls
Wrap	Auto Wrap*
Scroll	Smooth Scroll*
Text, Screen	Normal Video*
Cursor, No Cursor	Cursor*
Cursor Style	Block Cursor*
Cursor Blink	Steady*

General Set-Up

Mode	TI 931 Mode
Code Type	ASCII
User Features	User Features Unlocked
User Defined Keys	No Keyboard Protection
New Line	No New Line

Communications Set-Up

Transmit	9600
Receive	Receive = Transmit
XOFF	XOFF at 128
Bits, Parity	7 Bits, Odd Parity
Stop Bit	1 Stop Bit
Port	EIA Port, Modem Control
Disconnect, Delay	Disconnect, 2 second Delay
Transmit	Unlimited Transmit

Printer Set-Up

Speed	9600
Mode	Normal Printer Mode
Bits, Parity	7 Bits, Odd Parity
Stop Bit	1 Stop Bit
Print	Print Full Page
Print Data Type	ASCII/U.K.
Printer Terminator	No Terminator

Keyboard Set-Up

Break On, Off	Break
Auto Repeat	Auto Repeat*
Keyclick	No Keyclick*
Margin Bell	No Margin Bell*
Warning Bell	Warning Bell*
Auto Answerback	No Auto Answerback Function
Concealed	Not Concealed

Introduction

5.1 This section describes the Model 924 VDT screens displayed in set-up. With these screens you can review and alter the operating features, such as reverse video, VDT baud rate, and the number of columns displayed. Figure 5-1 shows the relationship between the set-up screens.

To enter set-up to use these screens, hold the Alt and Shift keys while pressing the Backspace key. To exit set-up once you finish using the screens, repeat this key sequence.

The VDT holds the set-up options in a nonvolatile RAM (NVR) memory. The selected features are retained even when power is off. The default settings are also retained in nonvolatile memory, so they can be restored during set-up after they have been changed.

Figure 5-1 Relationship of Set-Up Screens
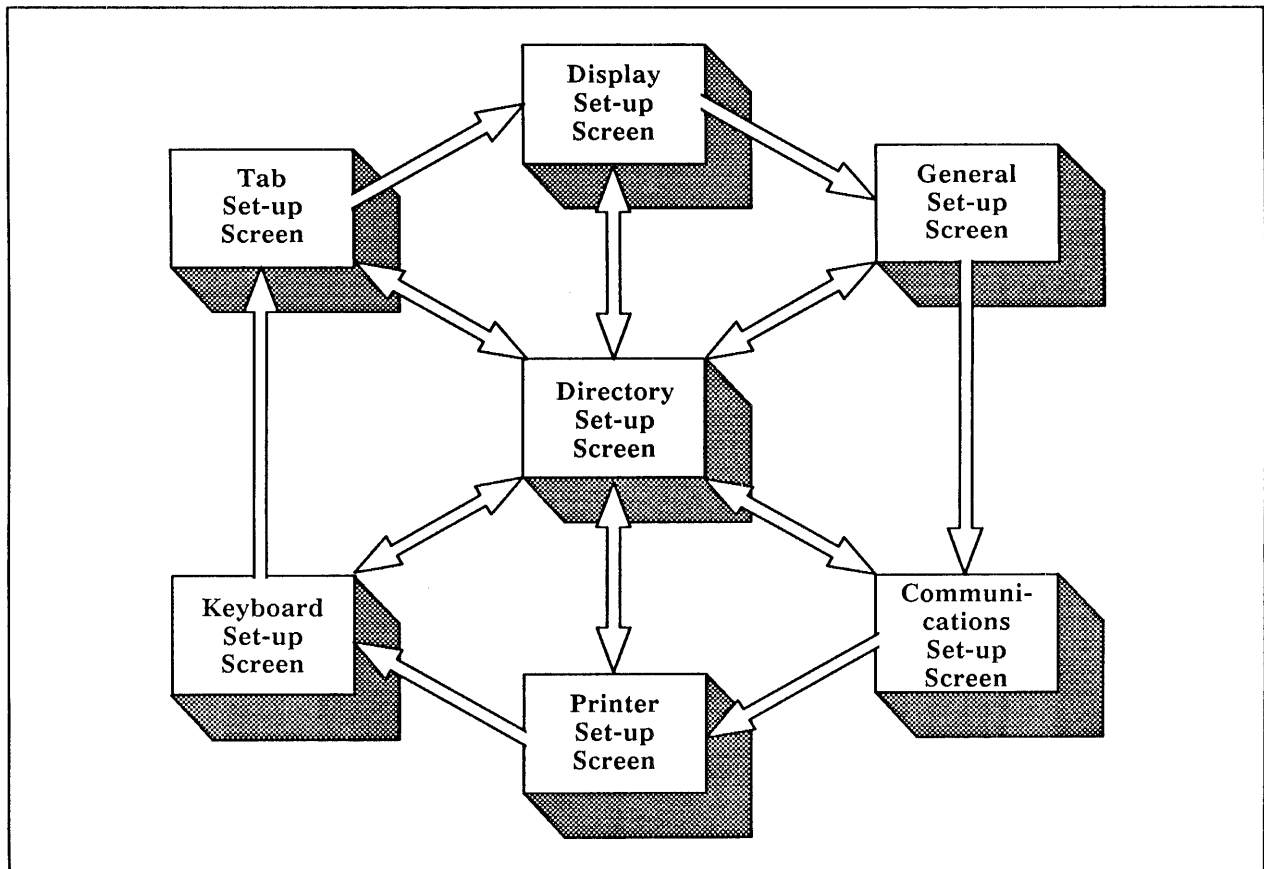
Set-Up Screens

5.2 Set-up screens occupy the last eight lines of the screen display. When a set-up screen appears, data previously displayed on the monitor is temporarily erased. Figure 5-2 shows a sample set-up screen. Each screen displays the following items:

■ Screen title

■ Terminal identifier

■ Firmware version number

■ Status line

■ Fields (action, parameter, text parameter)

The following paragraphs describe the information that appears on the screen.

Figure 5-2 Sample Set-Up Screen

TOP
SIXTEEN
LINES
OF
DISPLAY
ARE
BLANK

BOTTOM
EIGHT
LINES
OF
DISPLAY
CONTAIN
SET-UP
SCREEN

SCREEN TITLE

General Set-Up

TERMINAL
IDENTIFIER

Model 924 V1.0

To Next Set-Up   To Directory   TI924 Mode, 7 Bit Controls

User Features Unlocked   User Defined Keys Unlocked

No New Line   Numeric Keypad

LINES OF FIELDS
(ACTION PARAMETER,
TEXT PARAMETER)

Replace Mode   Printer: Not Ready   Modem: No DSR.

STATUS LINE

Screen Title 5.2.1 The screen title shows the name of the set-up screen that is currently displayed. The set-up screen names include:

- Set-Up Directory

- Display Set-Up

- General Set-Up

- Communications Set-Up

- Printer Set-Up

- Keyboard Set-Up

- Tab Set-Up

Status Line 5.2.2 The line on the bottom of each screen is known as the status line. This line reports the current status of the terminal insert/replace mode, the printer, and the modem mode (when EIA modem control is chosen).

The status line messages and their meanings are provided in Table 5-1.

Table 5-1

Status Line Messages

Report	Values	Meaning
Mode:		
	Replace	During text processing, if you enter a new character, it overwrites the character currently displayed where the cursor appears. Replace is the normal mode of operation.
	Insert	During text processing, if you enter a new character, it pushes to the right any characters currently displayed after the cursor on that line. In this mode, characters moved beyond the right margin are lost.
Printer:		
	Not Ready	The printer is not ready for operation.
	Ready	The printer is ready for operation.
	None	There is no available printer.
	Auto	The terminal is in the automatic print mode.
	Controller	The terminal is in the printer controller mode.
Modem:		
	DSR	The modem is ready to receive or (when connected) transmit information.
	No DSR	The modem is not ready to receive or transmit information.

Fields   **5.2.3** The set-up screen fields identify the current operating features. To choose a field, press the arrow keys to position the field cursor at the desired field. The field cursor appears as a highlighted rectangle to indicate the current field selected.

The following list describes the three types of fields and explains how to change them.

■ Action fields contain a single value. You direct the terminal to perform the desired action by specifying the appropriate action field and pressing the Enter key. For example, when you select the To Next Set-Up field and press the Enter key, the current screen is replaced by the next set-up screen.

■ Parameter fields contain self-describing text with two or more values. When you select a parameter field, press the Enter key to replace the current value of the field with the next value.

■ In text parameter fields, enter data by typing the value from the keyboard. Use the following procedure to enter text into a text parameter field.

   1. Use the arrow keys to position the field cursor on the text parameter field.

   2. Press the Enter key. A message appears in the status line prompting you to enter text.

   3. Type the text you want to replace the current value. The text you enter temporarily overwrites the status line.

   4. Press the Enter key. The value you entered in the status line is displayed adjacent to the prompt.

Set-Up Directory Screen

5.3 When you enter set-up, the system displays the Set-Up Directory screen, shown in Figure 5-3. The fields on this screen are described in the following list.

Display
Action Field
Function: Replaces the Set-Up Directory screen with the Display Set-Up screen.

General
Action Field
Function: Replaces the Set-Up Directory screen with the General Set-Up screen.

Comm
Action Field
Function: Replaces the Set-Up Directory screen with the Communications Set-Up screen.

Figure 5-3   Set-Up Directory Screen

```
                                                          Model 924 V1.0
         Set-Up  Directory                                ──────────────

         Display  General  Comm  Printer  Keyboard  Tab

         On Line  Clear Display  Clear Comm  Reset Terminal  Recall  Save

         North American Keyboard  Default  Exit
         ─────────────────────────────────────────────────────────────

           Replace Mode          Printer: None          Modem: DSR, Connected
```
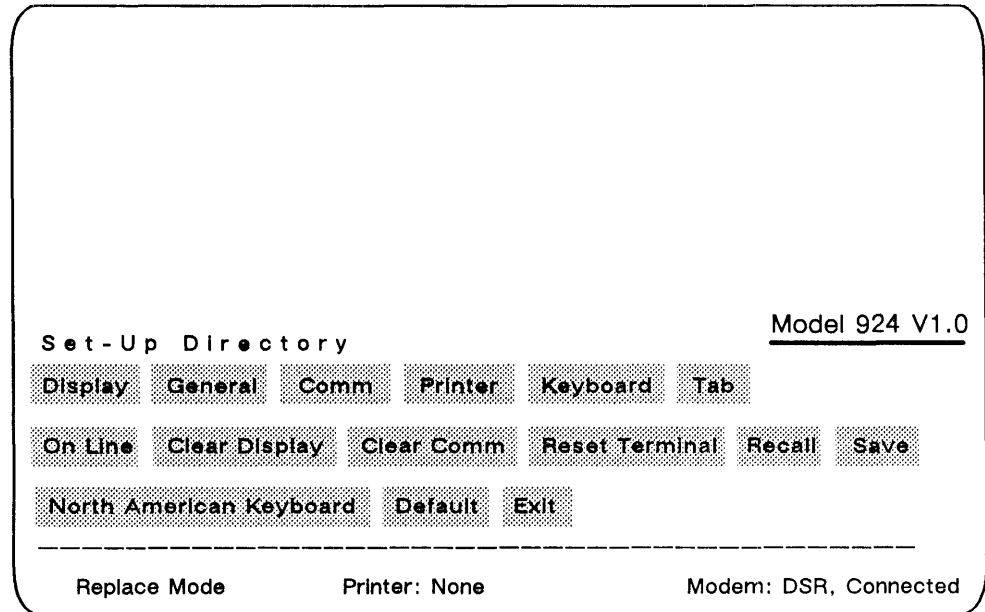
Printer
Action Field
Function: Replaces the Set-Up Directory screen with the Printer Set-Up screen.

Tab
Action Field
Function: Replaces the Set-Up Directory screen with the Tab Set-Up screen.

Keyboard
Action Field
Function: Replaces the Set-Up Directory screen with the Keyboard Set-Up
          screen.

On Line or Local
Parameter Field
Values: Online or Local
Function: Online lets the terminal interface with the host computer.

          Local disconnects the host computer. Keyboard entries are transmit-
          ted directly to the VDU screen.

Clear Display
Action Field
Function: Refreshes the VDU screen when you leave set-up.

Clear Comm
Action Field
Function: Clears communication by performing the following:

- Aborts any print operation occurring.

- Aborts any escape sequence, control sequence, or device control string (DCS) processing.

- Clears the keyboard buffers.

- Clears the receive buffer.

- Clears the transmit buffer.

- Takes the terminal out of printer controller mode.

- Transmits XON to the host port.

- Resets XOFF received flags on both ports (host and printer).

Reset Terminal
Action Field
Function: Resets terminal operating features to their default values.

Recall
Action Field
Function: Replaces all existing set-up characteristics with values stored in non-volatile memory with a save during the last set-up procedure. Recall also clears the VDU screen.

Note: Recall causes a disconnect to occur.

Save
Action Field
Function: Saves all set-up characteristics in all set-up screens.

_____Keyboard
Parameter Field
Values: North American, U.K., Norwegian/Danish, German/Austrian, Swiss (Roman), Swiss (German), Swedish, French, Spanish
Function: Enables you to specify the correct terminal operation for the keyboard you are using.

Default
Action Field
Function: Replaces all current set-up options with the established default settings. The VDU screen is refreshed and the cursor moves to the upper-left corner of the monitor.

Note: Default causes a disconnect to occur.

Exit
Action Field
Function: Exits set-up and returns the terminal to operating state (online or local).

Display Set-Up Screen

5.4 You use the Display Set-Up screen, shown in Figure 5-4, to specify VDU display characteristics. The fields on this screen are described in the following list.

Figure 5-4   **Display Set-Up Screen**

```
                                                              Model 924 V1.0
    D i s p l a y   S e t - U p                             _____

    To Next Set-Up     To Directory     Interpret Controls    80 Column

    No Auto Wrap    Smooth Scroll     Normal Video

    Cursor    Block Cursor Style     Steady
    _____

    Replace Mode          Printer: None          Modem: DSR, Connected
```

To Next Set-Up
Action Field
Function: Replaces the Display Set-Up Screen with the General Set-Up screen.

To Directory
Action Field
Function: Replaces the Display Set-Up Screen with the Set-Up Directory screen.

_____Controls
Parameter Field
Values: Interpret Controls (default), Display Controls
Function: Interpret Controls directs control codes received from either the keyboard or the host computer to be executed but not displayed.

Display Controls directs the control characters to be displayed but not performed.

_____Columns (924 Mode)
Parameter Field
Values: 80 Column (default), 132 Column
Function: Directs the terminal to display data in either 80 columns or 132 columns.

Auto Wrap
Parameter Field
Values: Auto wrap (default), No auto wrap
Function: Auto wrap causes a character entered beyond the right margin to be automatically displayed in the first character position of the next line. No auto wrap causes characters after the right margin to be deleted.

_____Scroll
Parameter Field
Values: Smooth Scroll (default), Jump Scroll
Function: Smooth Scroll restricts the rate at which new lines are displayed on the screen, resulting in a steady scroll.

Jump Scroll displays new lines as soon as the VDT receives them.

_____Text, _____Screen
Parameter Field
Values: Normal Video (default), Reverse Video
Function: Specifies the default screen display (text appears light and the screen dark) or a reverse video screen display (text appears dark and the screen light).

Cursor
Parameter Field
Values: Cursor (default), No Cursor
Function: Controls whether the text cursor appears on the screen.

Cursor Style
Parameter Field
Values: Block Cursor (default), Underline Cursor
Function: Specifies a block cursor or an underline cursor to be displayed on the screen.

Steady/Blinking Cursor
Parameter Field
Values: Steady cursor (default), Blinking cursor
Function: Selects whether the cursor blinks or remains lighted continuously.

**General
Set-Up Screen**

5.5 You use the General Set-Up screen, shown in Figure 5-5, to specify certain operating features. The fields on this screen are described in the following list.

Figure 5-5   **General Set-Up Screen**

```
/                                                                          \
|                                                                          |
|                                                                          |
|                                                                          |
|                                                                          |
|                                                                          |
|                                                                          |
|                                                              Model 924 V1.0
|   General Set-Up                                             _____  |
|   To Next Set-Up    To Directory    TI 924 Mode, 7 Bit Controls,   ASCII  |
|                                                                          |
|   User Features Unlocked,    User Defined Keys Unlocked                   |
|                                                                          |
|   No New Line    Numeric Keypad    Normal Cursor keys                     |
|   ---------------------------------------------------------------------  |
|   Replace Mode          Printer: None          Modem: DSR, Connected      |
\                                                                          /
```

To Next Set-Up
Action Field
Function: Replaces the General Set-Up screen with the Communications Set-Up
          screen.

To Directory
Action Field
Function: Replaces the General Set-Up screen with the Set-Up Directory
          screen.

_____Mode
Parameter Field
Values: 924 mode (8-bit controls); 924 mode (7-bit controls) (default); 931
mode; VT100 mode
Function: The 924 mode configures the terminal for use with application pro-
          grams designed for a TI 924 VDT. This mode allows the numeric
          keypad to be used for numeric entry.

          The 931 mode configures the terminal for use with application pro-
          grams designed for a TI 931 VDT. This mode includes the protected
          keyboard feature of the standard TI 931 terminal.

          The VT100 mode configures the terminal for use with application
          programs designed for a VT100 terminal for which strict VT100 com-
          patibility is necessary.

VT100_____
Parameter Field
Values: VT100 ASCII (default), VT100 U.K.
Function: VT100 ASCII causes the terminal to display # for code 35.

> VT100 U.K. causes the terminal to display a pound sterling sign for code 35.

> **Note:** This field is unique. It is only visible when the terminal is in the VT100 mode.

User Features
Parameter Field
Values: User Features Unlocked (default), User Features Locked
Function: The following user preference features are affected by this option:

- ■ Auto Repeat

- ■ Smooth/Jump Scroll

- ■ Light/Dark Screen

- ■ Tab Stops

- ■ Keyboard Lock

> **Note:** Some application programs control these user features. If this applies to your particular software, you should set the field to the User Features Unlocked value.

User Defined Keys_____ (931 Mode)
Parameter Field
Values: No keyboard protection (default); CTRL keyboard protection; ALT keyboard protection; CTRL and ALT keyboard protection
Function: Specifies whether the host can alter UDK definitions.

_____New Line
Parameter Field
Values: No New Line (default), New Line
Function: When No New Line is set, the Return or Enter key generates a carriage return only. When New Line is active, both a carriage return and a line feed are generated.

Keypad Field (TI 924 Mode)
Parameter Field
Values: Numeric Keypad (default); Multiply/Divide Keypad
Function: Numeric Keypad causes the auxiliary keypad to transmit ASCII character codes that represent numeric characters on the keys.

> Multiply/Divide Keypad causes the auxiliary keypad to transmit multiply and divide codes, shown on the front of the Space and Tab keys.

_____Cursor Keys (VT100 Mode)
Parameter Field
Values: Normal Cursor Keys (default), Application Cursor Keys
Function: Normal Cursor Keys transmits ANSI cursor control sequences (up, down, left and right).

> Application Cursor Keys transmits control functions of application software.

Communications Set-Up Screen

5.6 You use the Communications Set-Up screen, shown in Figure 5-6, to specify the terminal/host communications environment. The fields that appear on this screen are described in the following list.

Figure 5-6   **Communications Set-Up Screen**

```
/                                                                          \
|                                                                          |
|                                                                          |
|                                                                          |
|                                                                          |
|                                                                          |
|                                                              Model 924 V1.0 |
|   C o m m u n i c a t i o n s   S e t - U p          _____   |
|   ┌───────────────┐ ┌──────────────┐ ┌──────────────┐ ┌────────────────┐ |
|   │ To Next Set-Up│ │ To Directory │ │Transmit= 4800│ │Receive=Transmit│ |
|   └───────────────┘ └──────────────┘ └──────────────┘ └────────────────┘ |
|   ┌──────────┐ ┌────────────────┐ ┌──────────┐ ┌────────────────┐        |
|   │XOFF at 64│ │ 8 Bits, No Parity│ │1 Stop Bit│ │ No Local Echo │       |
|   └──────────┘ └────────────────┘ └──────────┘ └────────────────┘        |
|   ┌─────────────────────────┐ ┌──────────────────┐ ┌────────────────┐    |
|   │ EIA Port, Data Leads Only│ │Disconnect, 2 s Delay│ │Limited Transmit│ |
|   └─────────────────────────┘ └──────────────────┘ └────────────────┘    |
|   ─────────────────────────────────────────────────────────────────      |
|     Replace Mode              Printer: None                              |
\                                                                          /
```

To Next Set-Up
Action Field
Function: Replaces Communications Set-Up screen with Printer Set-Up screen.

To Directory
Action Field
Function: Replaces the Communications Set-Up screen with the Set-Up Directory screen.

Transmit_____
Parameter Field
Values: Transmit = 75, 110, 150, 300, 600, 1200, 2400, 4800, 9600, 19200 (default)
Function: Selects the speed at which the terminal transmits data to the host computer. The terminal transmit speed must equal the computer receive speed. The terminal, however, can transmit and receive at different rates.

Note: This option does not establish the format for the printer port.

Receive_____
Parameter Field
Values: Receive = 75, 110, 150, 300, 600, 1200, 2400, 4800, 9600, 19200, Receive = Transmit (default)
Function: Selects the speed at which the terminal receives data from the host computer. The terminal receive speed must equal the computer transmit speed. The terminal, however, can receive and send at different rates.

_____XOFF_____
Parameter Field
Values: XOFF at 64; XOFF at 128 (default); No XOFF
Function: Specifies the XOFF point or disables the automatic XON/XOFF flow
control. For most applications you should set XOFF at 64 or 128.

_____Bits, Parity_____
Parameter Field
Values: 8 Bits, No Parity
        8 Bits, Even Parity
        8 Bits, Odd Parity
        7 Bits, No Parity
        7 Bits, Even Parity
        7 Bits, Odd Parity (default)
        7 Bits, Mark Parity DD
        7 Bits, Space Parity
        7 Bits, Even Parity, No Check
        7 Bits, Odd Parity, No Check
        8 Bits, Even Parity, No Check
        8 Bits, Odd Parity, No Check
Function: Selects the character format used when the VDT and host computer
communicate.

Note: This option does not establish the format for the printer port.

_____Stop Bit_____
Parameter Field
Values: 1 Stop Bit (default); 2 Stop Bits
Function: Specifies the number (1 or 2) of stop bits the host port uses.

Note: This option does not establish the format for the printer port.

Local Echo (TI 924 and VT100 modes only)
Parameter Field
Values: No Local Echo (default); Local Echo
Function: Local Echo directs data from the keyboard to the VDU screen and
the host computer.

When No Local Echo is set, data from the keyboard is sent only to
the host, which may or may not transmit the data back to the termi-
nal screen. In the 931 mode this field is deleted and the VDT is
always set to No Local Echo.

_____Port_____
Parameter Field
Values: EIA Port, Data Leads Only; EIA Port, Modem Control (default)
Function: Specifies the port the VDT uses to communicate with the host com-
puter.

Select EIA Port, Data Leads Only for this field if the COMM port
connects the VDT and host.

Select EIA Port, Modem Control for this field if the COMM port
connects the VDT and the host, and an external modem requiring
EIA modem control is used.

Disconnect,_____Delay
Parameter Field
Values: Disconnect, 2 second Delay (default); Disconnect, 60 millisecond Delay
Function: When you use modem control, this option controls the time allowed before the terminal disconnects from the communications line when the received line signal detection (RLSD) is lost.

_____Transmit
Parameter Field
Values: Limited Transmit; Unlimited Transmit (default)
Function: Regulates the terminal transmit speed to 150–180 characters per second, regardless of the baud rate, to ensure a minimal interrupt burden on the operating system.

Printer Set-Up Screen

5.7 You use the Printer Set-Up screen, shown in Figure 5-7, to specify printer operations for the TI 924 VDT. The fields on this screen are described in the following list.

To Next Set-Up
Action Field
Function: Replaces the Printer Set-Up screen with the Keyboard Set-Up screen.

To Directory
Action Field
Function: Replaces the Printer Set-Up screen with the Set-Up Directory screen.

Speed_____
Parameter Field
Values: Speed = 75, 110, 150, 300, 600, 1200, 2400, 4800, 9600 (default), 19200
Function: Specifies the speed at which the terminal transmits data to a hardcopy printer.

_____Mode
Parameter Field
Values: Normal Printer Mode (default); Auto Printer Mode; Controller Mode
Function: Specifies the printer's operating mode.

Normal Printer Mode enables print functions to be invoked from the keyboard.

Auto Printer Mode causes the current line of text to be printed on receipt of line feed, form feed, or vertical tab codes from the host.

Controller Mode causes the printer port to treat the printer as a terminal while the TI 924 VDT monitors traffic (the host computer transfers data to the printer without the data being displayed on the VDU screen).

Figure 5-7   Printer Set-Up Screen

```
                                                                    Model 924 V1.0
    Printer  Set-Up                                                 ─────────────

    To Next Set-Up     To Directory    Speed=4800

    Normal Print Mode    8 Bits, No Parity    1 Stop Bit

    Print Full Page    ASCII/U.K.    No Terminator
    ─────────────────────────────────────────────────────────────

    Replace Mode              Printer: None
```

_____Bits,_____Parity
Parameter Field
Values: 7 Bits, No Parity
            7 Bits, Mark Parity
            7 Bits, Space Parity
            7 Bits, Even Parity
            7 Bits, Odd Parity (default)
            8 Bits, No Parity
            8 Bits, Even Parity
            8 Bits, Odd Parity
Function: Sets the character format used for communication with the printer.

_____Stop Bit_____
Values: 1 Stop Bit (default); 2 Stop Bits
Function: Sets the number of stop bits (1 or 2) to match those used by the
            printer.

Print_____
Parameter Field
Values: Print Full Page (default), Print Scroll Region
Function: Selects how much of the screen (the full screen or just the scrolling
            region) is to be printed during a print page operation.

Print Data Type (TI 924 Mode)
Parameter Field
Values: ASCII/U.K. (default); Extended Data; Extended Controls
Function: Selects the type of characters (from the terminal's character sets) to
            be sent to the printer.

            ASCII/U.K. should be selected for use with a printer that supports
            only the ASCII or U.K. character sets.

Printer Terminator
Parameter Field
Values: Terminator = FF; No Terminator (default)
Function: Selects whether or not a terminator (form feed) is sent at the end of a
print page operation.

**Keyboard
Set-Up Screen**

5.8 The Keyboard Set-Up screen, shown in Figure 5-8, lets you define operating features associated with the keyboard. The fields on this screen are described in the following list.

To Next Set-Up
Action Field
Function: Replaces the Keyboard Set-Up screen with the Tab Set-Up screen.

To Directory
Action Field
Function: Replaces the Keyboard Set-Up screen with the Set-Up Directory
screen.

Break
Parameter Field
Values: Break (default); No Break
Function: Enables or disables the Break key function.

Auto Repeat
Parameter Field
Values: Auto Repeat (default); No Auto Repeat
Function: Selects whether or not keystrokes are automatically repeated when
you hold down a key.

Figure 5-8   **Keyboard Set-Up Screen**

Model 924 V1.0

Keyboard   Set-Up

To Next Set-Up   To Directory   Break

Auto Repeat   Keyclick   Margin Bell   Warning Bell

No Auto Answerback   Answerback=   Not Concealed

Replace Mode   Printer: None

Keyclick
Parameter Field
Values: Keyclick; No Keyclick (default)
Function: Selects whether or not the keyboard generates a "click" sound each
time a key is pressed.

Margin Bell
Parameter Field
Values: Margin Bell; No Margin Bell (default)
Function: Selects whether or not the terminal generates a bell tone when the
text cursor approaches the right margin.

Warning Bell
Parameter Field
Values: Warning Bell (default); No Warning Bell
Function: Selects whether or not the terminal generates a bell tone for operating
errors, and upon receipt of Ctrl-G from the computer.

Auto Answerback
Parameter Field
Values: Auto Answerback; No Auto Answerback (default)
Function: Selects whether or not the answerback message is automatically sent
to the host computer after a communication line connection.

Answerback = Text Parameter Field
Value: Text Entry
Function: Allows an answerback message entry.

> The answerback message is a message which is sent on receipt of
> ENQ or by typing Ctrl-Break. In the case of ENQ, the message you
> enter is sent to the host without affecting screen data or requiring
> further operator action.

Concealed
Parameter Field
Values: Concealed; Not Concealed (default)
Function: Selects whether or not your answerback message entry is displayed on
the screen.

> When Concealed is selected, your answerback message is not dis-
> played on the screen. To reset this to Not Concealed, you must enter
> a new answerback message.

Tab Set-up Screen

5.9 The Tab Set-Up screen, shown in Figure 5-9, lets you set the terminal tab stop settings. Each tab stop field will show a "T" (if tab stop setting) or blank (if no tab stop setting).

You can control the field cursor by using the arrow keys. Press the Enter key to toggle between a "T" and "blank" in each field.

To Next Set-Up
Action Field
Function: Replaces the Tab Set-Up screen with the Display Set-Up screen.

To Directory
Action Field
Function: Replaces the Tab Set-Up screen with the Set-Up Directory screen.

Clear All Tabs
Action Field
Function: Clears all tabs previously set.

Set 8 Column Tabs
Action Field
Function: Automatically sets tabs every 8 columns starting with column 9.

Figure 5-9   Tab Set-Up Screen

```
                                                    Model 924 V1.0
 Tab  Set-Up                                        ─────────────

 To Next Set-Up     To Directory    Clear All Tabs    Set 8 Column Tabs

            T         T         T         T         T         T         T         T         T
 12345678901234567890 1234567890 1234567890 1234567890 1234567890 1234567890 1234567890
 ──────────────────────────────────────────────────────────────────────────
    Replace Mode           Printer: None
```
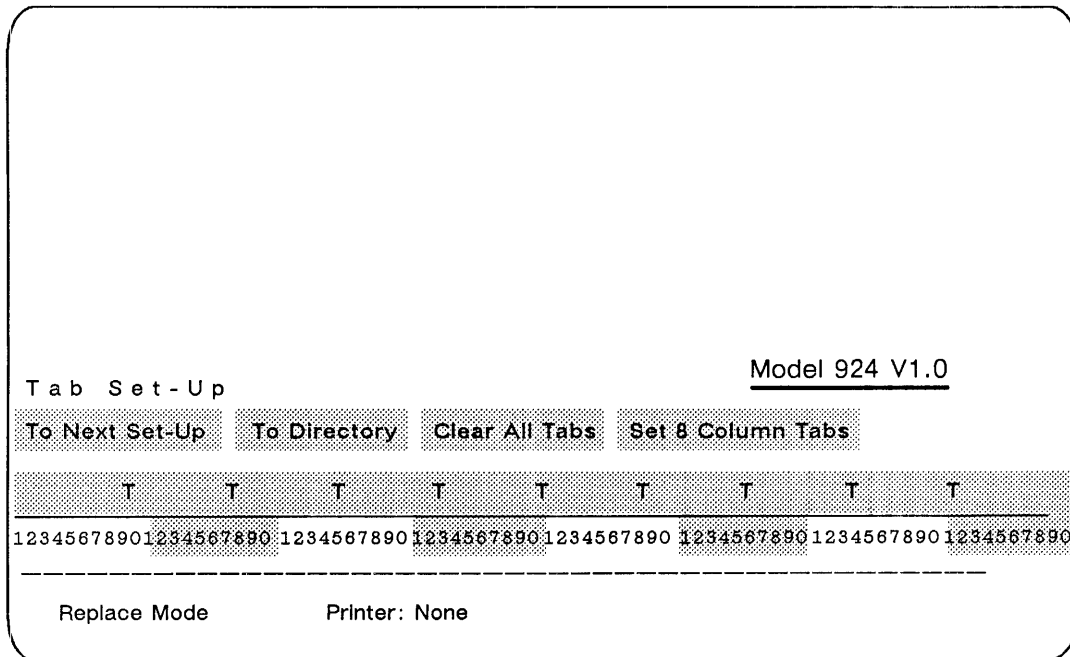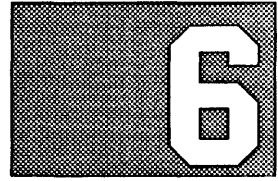
COMMUNICATION ENVIRONMENT ▮**6**

Introduction

6.1 The TI 924 VDT operates on full-duplex asynchronous lines only. It has ten possible transmit/receive speeds that are selected during set-up. The TI 924 VDT operates in accordance with the following national and international communications standards.

■ EIA Standard RS-232C/RS-423

■ CCITT V.24

■ CCITT V.26 (V.10)

■ CCITT X.20 (V.21)

The terminal can be connected directly to a local host computer via cable. The terminal can also be connected indirectly to a remote host computer through public-switched or dedicated telephone lines using a modem.

Host and Printer Port Interfaces

6.2 The TI 924 VDT has two asynchronous serial ports; one for communication with a host computer, and another for communication with a hard-copy printer.

The host port uses a 25-pin Subminiature D type (EIA RS-232C/RS-423) connector to connect the terminal to a local or remote host computer. Table 6-1 shows the pin connections for the communications port.

The printer port also uses a 25-pin Subminiature D type (EIA RS-2323C/RS-423) connector to connect the terminal to a local hard-copy printer. Table 6-2 shows the pin connections for the printer port.

Table 6-1 Communication Port EIA Interface Signals

Pin	Signal	Mnemonic	EIA/CCITT/DIN	Description
1	Protective ground	PGND	AA/101/E1	Connects to terminal chassis. Also connects to external ground through third wire of power cord.
2	Transmit data	TXD	BA/103/D1	From TI 924 VDT: Transmits serial characters. Held in mark state when no characters are transmitted. In modem control modes, transmits data only when RTS, CTS, DSR, and DTR are on.

Table 6-1 Communication Port EIA Interface Signals (Continued)

Pin	Signal	Mnemonic	EIA/CCITT/DIN	Description
3	Received data	RXD	BB/104/D2	To TI 924 VDT: Receives serial characters. In modem control modes, ignores characters if either RLSD or DSR is off.
4	Request to send	RTS	CA/05/S2	From TI 924 VDT: When on, places the modem in transmit mode.
5	Clear to send	CTS	CB/106/M2	To TI 924 VDT: When on, tells the terminal that the modem is ready to transmit.
6	Data set ready	DSR	CC/107/M1	To TI 924 VDT: When on, tells the terminal that the modem is in the data mode and is ready to exchange RTS, CTS, and RLSD.
7	Signal ground	SGND	AB/102/E2	Common ground reference potential for all connector signals except protective ground.
8	Receive line signal detect (carrier detect)	RLSD	CF/109/M5	To TI 924 VDT: When on, tells the terminal that the signal received on the communication line is of sufficient quality to ensure proper demodulation of received data. When off, indicates no signal received or signal unsuitable for demodulation.
12	Speed indicator	SPDI	CI/112/M4	To TI 924 VDT: When on, indicates that the modem is operating at the higher of two speeds. For example: 1200 bits per second for Bell 212A or 2400 bits per second for Hayes® 2400 Smartmodem™.
20	Data terminal ready	DTR	CD/108.2/S1.2	From TI 924 VDT: When on, tells the modem that the terminal is ready to transmit or receive.
23	Data signal rate selector	SPDS	CH/111/S4	From TI 924 VDT: When on, tells the modem to select the higher data signaling rate (speed).

Hayes is a trademark, and Smartmodem is a registered trademark, of Hayes Microcomputer Products, Inc.

Table 6-2 Printer Port EIA Interface Signals

Pin	Signal	Mnemonic	EIA/CCITT/DIN	Description
1	Protective ground	PGND	AA/101/E1	Connects to terminal chassis. Also connects to external ground through third wire of power cord.
2	Transmitted data	TXD	BA/103/D1	From TI 924 VDT: Transmits serial characters. Held in mark state when no characters are transmitted.
3	Receive data	RXD	BB/104/D2	To TI 924 VDT: Receives serial characters for flow control.
4	Request to send	RTS	CA/105/S2	From TI 924 VDT: On when the terminal is on.
5	Data terminal ready	DTR	CD/108.2/S1.2	From TI 924 VDT: On when the terminal is online.
6	Data set ready	DSR	CC/107/M1	To TI 924 VDT: Receives DTR on this line. On when printer is online.
7	Signal ground	SGND	AB/102/E2	Common ground reference for all voltages on interface.

Printers

6.3   The 924 VDT can be connected to a local asynchronous serial printer. To connect to a TI 855, 865, 880, or 2015 printer, use TI part number 2230504 cable. To connect to a TI 810, 850, or 860 printer, use TI part number 2308663 cable.

Modems

6.4   The TI 924 VDT can operate with any asynchronous modems that conform to national and international standards. However, the modem at the terminal end must be compatible with the modem at the host computer end. The terminal must be certified for connection to non-Bell type modems used outside of continental North America. To connect the TI 924 VDT to an asynchronous modem, use TI cable part number 2532883.

Character Format

6.5   The character format is selectable in set-up. The terminal transmits and receives characters in serial format.

Terminal/Printer Data Flow Control

6.6 The TI 924 VDT transmits only data characters to the printer; it does not send XON/XOFF. The terminal recognizes only XON/XOFF from the printer. Any other characters from the printer are ignored. A break response from the printer is ignored.

Upon receipt of XOFF from the printer, the terminal stops sending data until it receives an XON or until a Clear Comm operation is performed.

TI 810, 850, and 860 printers support data flow control via signal pacing. One output pin (pin 11) on the printer interface functions as a ready/busy indicator. The ready/busy pin is held in a high (on) state when the printer can receive data, and in a low (off) state when the printer needs to stop data flow. The TI cable, part number 2308663, connects printer pin 11 to 924 VDT pin 6 (DSR). With this cable the 924 VDT can use the DSR pin to control data flow.

Terminal/Host Data Flow Control

6.7 The terminal stores incoming characters in a character input buffer and processes the characters on a first-in/first-out basis. The size of the input buffer is 254 characters.

NOTE: If XOFF is disabled in set-up, the input buffer filling condition does not send XOFF to the host computer. The keyboard Hold Screen key is disabled. You can lose data with XOFF disabled.

If XON/XOFF is enabled, the terminal recognizes received XON and XOFF. Receipt of XOFF stops the terminal from transmitting (except XON/XOFF characters). If the keyboard data buffer overflows, the keyboard locks. Transmission resumes upon receipt of XON.

Conditions That Transmit XON

6.7.1 When the XOFF/XON feature is enabled in set-up, the following conditions transmit XON.

■ The self-test is completed.

■ The Recall function is performed.

■ The Clear Comm function is performed.

■ The number of characters in the input buffer reaches the XON point (32 characters) and the last flow control character sent was XOFF.

Conditions That Transmit XOFF

6.7.2 When the XOFF/XON feature is enabled in set-up, the following conditions transmit XOFF.

■ A character is received when the input buffer is full (256 characters).

■ The number of characters in the input buffer reaches the first XOFF point (64 or 128 characters, selected in set-up) for the first time since the last XON was sent.

■ The number of characters in the input buffer reaches the second XOFF point (220 characters) for the first time since the last XON was sent.

PROGRAMMING
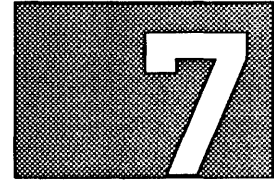
Introduction

7.1 This section describes the programming commands used to control the 924 terminal from a host computer. Some of this information is also applicable to the VT100 and 931 emulation modes provided by the terminal. For more detailed information on these emulations, refer to Appendix G.

Applicable Standards

7.2 The Model 924 VDT conforms to the following character encoding standards used by the computer communications industry.

■ ANSI X3.4 (1977) — American Standard Code for Information Interchange (ASCII).

■ ISO 646 (1977) — 7-Bit Coded Character Set for Information Processing Interchange.

■ ANSI X3.41 (1974) — Code Extension Techniques for Use With the 7-Bit Coded Character Set of American National Code Information Interchange.

■ ISO Draft International Standard 2022.2 — 7-Bit and 8-Bit Coded Character Sets—Code Extension Techniques.

■ ANSI X3.64 (1979) — Additional Controls for Use With American National Code Information Interchange.

■ ISO Draft International Standard 6429.2 — Additional Control Functions for Character Imaging Devices.

■ ISO Draft International Standard 8859/1 8-Bit Single Byte Code Graphic Character Sets Part 1: Latin Alphabet No. 1.

Notation

7.3 Throughout this section a column/row notation is used to represent characters and codes. This notation is derived from the concept of a code table. A code table is a graphical method of showing the characters allocated to each bit combination for a particular code. The code tables used by the 924 VDT take column values from the four most significant bits in the character, and row values from the four least significant bits in the character, as shown in Figure 7-1.

Figure 7-1

Code Table Rows and Columns

Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1

Column   Row
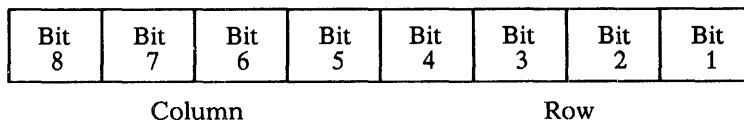
The row and column numbers are expressed as decimal numbers. As an example of the use of this notation, the ASCII encoding for an "M" (hexadecimal 4D) occurs in the ASCII code table in column 4, row 13, which is expressed as 4/13.

A two-line stacked format is used to represent codes. The top line contains the column/row notation for the characters. The bottom line consists of ASCII graphic characters and mnemonics (abbreviations) for control characters. For example, the code for the Next Line function is written as follows:

Next Line	1/11	4/5
(NEL)	ESC	E

This notation indicates that the mnemonic for the Next Line function is NEL; that the two-character control sequence is ESC E; and that the encoding for ESC is 1/11 from the code table.

Certain sequences include parameter strings. Depending upon usage, the following general notation is used for parameter strings:

- Ps — A selective parameter string.

- Pn — A parameter string with numeric encoding.

Code Tables and Character Sets

7.4 The code table used by the 924 VDT consists of 16 rows of 16 column entries each. The VT100 and TI 931 modes use only the left half of this 8-bit code table. The entries in this half of the table correspond to the data values in the 7-bit code.

Character Classification

7.4.1 The characters transmitted and received by the 924 VDT can be categorized as either graphic characters or control characters.

Graphic characters cause visible symbols to be displayed on the screen. Graphic character examples include alphanumeric symbols, punctuation symbols, and special symbols, such as arithmetic operators.

Control characters are single-byte codes that cause either formatting or data communication functions to be performed. Example control characters include formatting functions, such as tab (0/9), and communication functions, such as Device Control 3 (1/3).

Code Elements   **7.4.2** The code table implemented by the 924 VDT is broken into four distinct code elements. Each of these elements has a well-defined set of meanings.

■ **C0 Controls.** The C0 *(Control zero)* set of 32 control functions occupies positions 0/0 through 1/15 in the code table. The functions of the C0 control codes are identical to the control definitions in 7-bit USASCII.

■ **C1 Controls.** The C1 *(Control one)* set of 32 control functions occupies positions 8/0 through 9/15 in the code table. Most functions of the C1 control codes are defined by ISO 2022. Some C1 codes are still in the process of being defined.

■ **GL and GR Graphics.** The graphic characters in the code table are named GL (graphic left) and GR (graphic right). There are 94 GL characters which occupy code positions 2/1 through 7/14 in the code table. The GR character set can contain either 94 or 96 characters. If a 94-character graphic character set is used in GR, it occupies positions 10/1 through 15/14 in the code table. If a 96-character graphic character set is used in GR, it occupies code positions 10/0 through 15/15 in the code table. Unlike the control characters, the GL and GR characters may be assigned different shapes when under control of the host computer.

■ **G0, G1, G2, and G3 Graphics.** The 924 VDT provides for concurrent access to four graphic character sets. These graphic sets are assigned the names G0, G1, G2, and G3. The attributes of each graphic set are shown in Table 7-1.

The process of causing a designated character set to assume a particular set of code values is called *invocation.* Invocation commands are control sequences used to invoke a numbered graphic set (G0, G1, G2, or G3) into either GL or GR of an 8-bit code. Invocation commands are described completely in paragraph 7.6.4.

Table 7-1

Graphic Code Sets

Set	Description	Code Table Columns
G0	94 graphic characters	02 through 07
G1	94 or 96 graphic characters	02 through 07 or 10 through 15
G2	94 or 96 graphic characters	02 through 07 or 10 through 15
G3	94 or 96 graphic characters	02 through 07 or 10 through 15

Graphic Repertoire   **7.4.3** The graphic repertoire of the 924 VDT consists of five predefined character sets (called *hard* character sets) and one user-definable dynamic character set (called a *soft* character set). The hard character sets include USASCII, UKASCII, VT100 Special Graphics, 931 Line Drawing Graphics, and ISO 8859/1 Multinational Graphics. The character sets available with the 924 VDT are described in the following paragraphs.

The process of identifying any character set in the graphic repertoire and mapping it to a numbered graphic set (G0, G1, G2, or G3) is called *designation*. Designation commands are control sequences used to map a character set to a numbered graphic set. Designation commands are described completely in paragraph 7.6.3.

USASCII   **7.4.3.1** USASCII is a variant of the ISO 646 code set used in most English-speaking countries. Symbols included in USASCII include alphabetic characters, punctuation marks, and various other symbols. The USASCII code table is shown in Table 7-2.

Table 7-2   **USASCII Code Table**

Column

Row	0	1	2	3	4	5	6	7
0	NUL	DLE	space	0	@	P	'	p
1	SOH	DC1	!	1	A	Q	a	q
2	STX	DC2	"	2	B	R	b	r
3	ETX	DC3	#	3	C	S	c	s
4	EOT	DC4	$	4	D	T	d	t
5	ENO	NAK	%	5	E	U	e	u
6	ACK	SYN	&	6	F	V	f	v
7	BEL	ETB	'	7	G	W	g	w
8	BS	CAN	(	8	H	X	h	x
9	HT	EM	)	9	I	Y	i	y
10	LF	SUB	*	:	J	Z	j	z
11	VT	ESC	+	;	K	[	k	{
12	FF	IS1	,	<	L	\	l		
13	CR	IS2	_	=	M	]	m	}
14	SO	IS3	.	>	N	^	n	~
15	SI	IS4	/	?	O	–	o	DEL

◄ C0 Codes ► ◄——————— GL Codes ———————►

When the 924 VDT is powered on, the USASCII character set is designated into G0 and invoked into GL. The USASCII character set is always invoked into GL when used because it is a 7-bit code.

UKASCII　**7.4.3.2** UKASCII is a national variant of the ISO 646 code set used in the United Kingdom. UKASCII is identical to USASCII with the exception that it includes the English currency symbol (£). The UKASCII code table is shown in Table 7-3.

Table 7-3　　　　　　**UKASCII Code Table**

Column

Row	0	1	2	3	4	5	6	7
0	NUL	DLE	space	0	2	P	'	p
1	SOH	DC1	!	1	A	Q	a	q
2	STX	DC2	"	2	B	R	b	r
3	ETX	DC3	#	3	C	S	c	s
4	EOT	DC4	£	4	D	T	d	t
5	ENO	NAK	%	5	E	U	e	u
6	ACK	SYN	&	6	F	V	f	v
7	BEL	ETB	'	7	G	W	g	w
8	BS	CAN	(	8	H	X	h	x
9	HT	EM	)	9	I	Y	i	y
10	LF	SUB	*	:	J	Z	j	z
11	VT	ESC	+	;	K	[	k	{
12	FF	IS1	,	<	L	\	l	¦
13	CR	IS2	_	=	M	]	m	}
14	SO	IS3	.	>	N	^	n	~
15	SI	IS4	/	?	O	–	o	DEL

|◀ C0 Codes ▶|◀——————— GL Codes ———————▶|

The UKASCII character set is always invoked into GL when used because it is a 7-bit code. UK users may also use the 8859/1 Multinational character set if their host supports 8-bit terminals.

7.4.3.3 The VT100 Special Graphics character set (VT100 line-drawing graphics) consists of symbols suitable for creating simple pictures on the screen. All of the uppercase USASCII symbols are included in the VT100 Special Graphics character set, along with certain punctuation symbols and lowercase characters. The VT100 Special Graphics code table is shown in Table 7-4.

Table 7-4 **VT100 Special Graphics Code Table**

Column

Row	0	1	2	3	4	5	6	7
0	NUL	DLE	space	0	@	P	◆	scan 3
1	SOH	DC1	!	1	A	Q		scan 5
2	STX	DC2	"	2	B	R	HT	scan 7
3	ETX	DC3	#	3	C	S	FF	scan 9
4	EOT	DC4	$	4	D	T	CR	⊢
5	ENO	NAK	%	5	E	U	LF	⊣
6	ACK	SYN	&	6	F	V	°	⊥
7	BEL	ETB	'	7	G	W	±	⊤
8	BS	CAN	(	8	H	X	NL	|
9	HT	EM	)	9	I	Y	YT	≤
10	LF	SUB	*	:	J	Z	⌋	≥
11	VT	ESC	+	;	K	[	⌉	
12	FF	IS1	,	<	L	\	⌈	≠
13	CR	IS2	_	=	M	]	⌊	£
14	SO	IS3	.	>	N	^	|	.
15	SI	IS4	/	?	O	blank	scan 1	DEL

◄ C0 Codes ► | ◄———————— GL Codes ————————►

The VT100 Special Graphics character set may be invoked into either GL or GR for use. Most VT100-compatible applications will use this character set in GL, alternating between USASCII and VT100 Special Graphics.

7.4.3.4 The 931 Line Drawing Graphics character set contains 32 line-drawing characters compatible with those provided on the 931 terminal. The 931 Line Drawing Graphics code table is shown in Table 7-5.

NOTE: In the 931 terminal the line-drawing graphics characters were always invoked into GL. The 924 implementation has extended this definition to allow invocation into either GL or GR. In the 931 terminal, character positions 4/1 through 7/14 of the line-drawing character set were undefined. In the 924 implementation, these positions have been defined to be identical to the symbols in the USASCII code table.

Table 7-5

931 Line Drawing Graphics Code Table

Column

Row	0	1	2	3	4	5	6	7
0	NUL	DLE	space	0	@	P	`	p
1	SOH	DC1	!	1	A	Q	a	q
2	STX	DC2	"	2	B	R	b	r
3	ETX	DC3	$	3	C	S	c	s
4	EOT	DC4	%	4	D	T	d	t
5	ENO	NAK	%	5	E	U	e	u
6	ACK	SYN	&	6	F	V	f	v
7	BEL	ETB	'	7	G	W	g	w
8	BS	CAN	(	8	H	X	h	x
9	HT	EM	)	9	I	Y	i	y
10	LF	SUB	*	:	J	Z	j	z
11	VT	ESC	+	;	K	[	k	{
12	FF	IS1	,	<	L	\	l	¦
13	CR	IS2	–	=	M	]	m	}
14	SO	IS3	.	>	N	^	n	~
15	SI	IS4	/	?	O	_	o	DEL

|◄ C0 Codes ►| ◄─────── GL Codes ───────► |

The 931 Line Drawing Graphics character set may be invoked into either GL or GR for use, depending upon the host computer.

7.4.3.5 The ISO 8859/1 Multinational Graphics character set consists of 189 symbols suitable for use in 44 different countries. The diacritical marks and accented vowels are included for most Latin alphabets. Multiple currency symbols along with many more special symbols are included. USASCII is a 7-bit subset of ISO 8859/1. The symbols assigned to GR in ISO 8859/1 are shown in Table 7-6.

Table 7-6

ISO 8859/1 Multinational Graphics Code Table

Column

Row	8	9	10	11	12	13	14	15
0	–	DCS		°	À		à	
1	–	PU1	¡	±	Á	Ñ	á	ñ
2	BPH	PU2	¢	²	Â	Ò	â	ò
3	NBH	STS*	£	³	Ã	Ó	ã	ó
4	IND*	CCH			Ä	Ô	ä	ô
5	NEL	MW	¥	¶	Å	Õ	å	õ
6	SSA	SSA*			Æ	Ö	æ	ö
7	ESA	EPA*	§	·	Ç	Œ	ç	œ
8	HTS	SOS	⊗		È	ø	è	ø
9	HTJ	–	©	¹	É	Ù	é	ù
10	VTS	SCI	ª	º	Ê	Ú	ê	ú
11	PLD	CSI	≪	≫	Ë	Û	ë	û
12	PLU	SI		1/4	Ì	Ü	ì	ü
13	RI	OSC		1/2	Í	Ÿ	í	ý
14	SS2	PM			Î		î	
15	SS3	APC		¿	Ï	β	ï	

| ← C0 Codes → | ← GR Codes → |

– Denotes standard use not currently defined

* Denotes standard usage under review

When the 924 VDT is powered on, ISO 8859/1 is designated into G0 and G2, and invoked into both GL and GR.

Dynamically | **7.4.3.6** In addition to the predefined character set capability, the 924 also
Redefinable | enables programmers to define, download, name, and invoke a user-defined
Character Set | character set under control of the host computer. This character set is referred
to as a dynamically redefinable character set (DRCS). This character set can be
assigned a unique name to augment the character-handling capabilities of the
terminal, or it can be named such that it replaces one of the predefined charac-
ter sets. The DRCS occupies a 10×10 portion of the 924's 10×14 character
cell, as shown in Figure 7-2.

Figure 7-2   **Position of DRCS in Character Dot Matrix**

Dot Matrix Columns

	0	1	2	3	4	5	6	7	8	9	
0	.	.	.	.	.	.	.	.	.	.	Diacritical Marks
1	.	.	.	.	.	.	.	.	.	.	Diacritical Marks
2	.	.	.	.	.	.	.	.	.	.	
3	.	.	.	.	.	.	.	.	.	.	
4	.	.	.	.	.	.	.	.	.	.	
5	.	.	.	.	.	.	.	.	.	.	
6	.	.	.	.	.	.	.	.	.	.	Character Space
7	.	.	.	.	.	.	.	.	.	.	
8	.	.	.	.	.	.	.	.	.	.	
9	.	.	.	.	.	.	.	.	.	.	
10	.	.	.	.	.	.	.	.	.	.	
11	.	.	.	.	.	.	.	.	.	.	Descenders
12	.	.	.	.	.	.	.	.	.	.	Descenders
13	.	.	.	.	.	.	.	.	.	.	Interline Space

Dot Matrix Rows (rows 0–13 at left)

A DRCS can contain from 1 to 94 characters. It can be invoked into either
code table columns 2 through 7 or 10 through 15. Character sets which use
positions 10/0 and 15/15 are not possible using DRCS because of the limitation
to 94 rather than 96 bytes. Paragraph 7.6 provides more information about the
device control string format used to construct an application-specific DRCS.

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924 VDT   **7.5** The following paragraphs describe the codes that can be generated from
Keyboard Codes the 924 VDT keyboard and transmitted to the host computer. Other codes can
be generated in response to host computer requests for status reports. These
handshaking sequences are defined in paragraphs 7.6.18 through 7.6.20.

C0 Control Codes   **7.5.1** To generate a C0 control code, press and hold the CTRL key in conjunction with another key. The list of keys used to generate the C0 code set is shown in Table 7-7.

The 924 VDT also has dedicated keys for C0 functions such as Backspace, Escape, Return, and Tab.

Table 7-7 Generating C0 Codes From the 924 Keyboard

C0 Control Function	Mnemonic	Code	Generated by (CTRL)
Null	NUL	0/00	2 or spacebar
Start of header	SOH	0/01	A
Start of text	STX	0/02	B
End of text	ETX	0/03	C
End of transmission	EOT	0/04	D
Enquiry	ENQ	0/05	E
Acknowledge	ACK	0/06	F
Bell	BEL	0/07	G
Backspace	BS	0/08	H
Horizontal tab	HT	0/09	I
Line feed	LF	0/10	J
Vertical tab	VT	0/11	K
Form feed	FF	0/12	L
Carriage return	CR	0/13	M
Shift out	SO	0/14	N
Shift in	SI	0/15	O
Data line escape	DLE	1/00	P
Device control 1	DC1	1/01	Q
Device control 2	DC2	1/02	R
Device control 3	DC3	1/03	S
Device control 4	DC4	1/04	T
Negative acknowledgement	NAK	1/05	U
Synchronous idle	SYN	1/06	V
End of text block	ETB	1/07	W
Cancel	CAN	1/08	X
End of media	EM	1/09	Y
Substitute	SUB	1/10	Z
Escape	ESC	1/11	[or 3
File separator/IS4	FS/IS4	1/12	\ or 4
Group separator/IS3	GS/IS3	1/13	] or 5
Record separator/IS2	RS/IS2	1/14	- or 6
Unit separator/IS1	US/IS1	1/15	? or 7
Delete	DEL	7/15	8

C1 Control Codes   **7.5.2**   To generate a C1 control code, press and hold the ALT and CTRL keys in conjunction with another key. The list of keys used to generate the C1 code set is shown in Table 7-8.

Table 7-8   Generating C1 Codes From the 924 Keyboard

C1 Control Functions	Mnemonic	8-Bit Code	7-Bit Code	Generated by (ALT-CTRL)
	–	8/00	ESC @	2
	–	8/01	ESC A	A
Break permitted here	BPH	8/02	ESC B	B
No break here	NBH	8/03	ESC C	C
Index	IND	8/04	ESC D	D
Next line	NEL	8/05	ESC E	E
Start of selected area	SSA	8/06	ESC F	F
End of selected area	ESA	8/07	ESC G	G
Horizontal tab set	HTS	8/08	ESC H	H
Horizontal tab with justify	HTJ	8/09	ESC I	I
Line tabulation set	VTS	8/10	ESC J	J
Partial line down	PLD	8/11	ESC K	K
Partial line up	PLU	8/12	ESC L	L
Reverse index	RI	8/13	ESC M	M
Single shift 2	SS2	8/14	ESC N	N
Single shift 3	SS3	8/15	ESC O	O
Device control string	DCS	9/00	ESC P	P
Private use 1	PU1	9/01	ESC Q	Q
Private use 2	PU2	9/02	ESC R	R
	–	9/03	ESC S	S
Cancel character	CCH	9/04	ESC T	T
Message waiting	MW	9/05	ESC U	U
	–	9/06	ESC V	V
	–	9/07	ESC W	W
Start of string	SOS	9/08	ESC X	X
	–	9/09	ESC Y	Y
	–	9/10	ESC Z	Z
Control seq. introducer	CSI	9/11	ESC [	[or 3
String terminator	ST	9/12	ESC \	\ or 4
Operating system command	OSC	9/13	ESC]	] or 5
Privacy message	PM	9/14	ESC	~ or 6
Application program command	APC	9/15	ESC _	? or 7

7.5.3 The 924 keyboard has several sets of special-purpose keys. The functions provided by these keys and the codes transmitted are described in the following paragraphs.

Cursor Control Keys   **7.5.3.1** The cursor control keys are used to move the current active position. The host application software normally controls whether such keys are enabled. The codes transmitted by the cursor control keys are shown in Table 7-9.

Table 7-9

Cursor Control Key Sequences

Cursor Control Function	Transmitted Sequence		7-Bit Equivalent		
up arrow	CSI 9/11	A 4/1	CSI 1/11	5/11	A 4/1
down arrow	CSI 9/11	B 4/2	CSI 1/11	5/11	B 4/2
right arrow	CSI 9/11	C 4/3	CSI 1/11	5/11	C 4/3
left arrow	CSI 9/11	D 4/4	CSI 1/11	5/11	D 4/4
HOME	CSI 9/11	H 4/8	CSI 1/11	5/11	H 4/8

Function Keys   **7.5.3.2** The 924 has 12 general-purpose function keys that generate 24 unique codes for use by application programmers. The codes transmitted by these keys are shown in Table 7-10. Certain function key codes can be changed by the programmer or operator. The keys that can be user-defined are noted by an asterisk.

Table 7-10

Function Key Codes

Key Number	Key Name	Transmitted Sequence			
1	F1	SS3 8/15	P 5/0		
2	F2	SS3 8/15	Q 5/1		
3	F3	SS3 8/15	R 5/2		
4	F4	SS3 8/15	S 5/3		
5	F5	CSI 9/11	1 3/1	6 3/6	~ 7/14
6	F6	CSI 9/11	1 3/1	7 3/7	~ 7/14

Table 7-10

Function Key Codes (Continued)				
Key Number	**Key Name**	**Transmitted Sequence**		
7	F7	CSI 9/11	1 3/1	8 3/8	~ 7/14
8	F8	CSI 9/11	1 3/1	9 3/9	~ 7/14
9	F9	CSI 9/11	2 3/2	0 3/0	~ 7/14
10	F10	CSI 9/11	2 3/2	1 3/1	~ 7/14
11	F11	CSI 9/11	2 3/2	3 3/3	~ 7/14
12	F12	CSI 9/11	2 3/2	4 3/4	~ 7/14
13*	(SHIFT) F1	CSI 9/11	2 3/2	5 3/5	~ 7/14
14*	(SHIFT) F2	CSI 9/11	2 3/2	6 3/6	~ 7/14
15*	(SHIFT) F3	CSI 9/11	4 3/4	0 3/0	~ 7/14
16*	(SHIFT) F4	CSI 9/11	4 3/4	1 3/1	~ 7/14
17*	(SHIFT) F5	CSI 9/11	4 3/4	2 3/2	~ 7/14
18*	(SHIFT) F6	CSI 9/11	4 3/4	3 3/3	~ 7/14
19*	(SHIFT) F7	CSI 9/11	4 3/4	4 3/4	~ 7/14
20*	(SHIFT) F8	CSI 9/11	4 3/4	5 3/5	~ 7/14
21*	(SHIFT) F9	CSI 9/11	4 3/4	6 3/6	~ 7/14
22*	(SHIFT) F10	CSI 9/11	4 3/4	7 3/7	~ 7/14
23*	(SHIFT) F11	CSI 9/11	4 3/4	8 3/8	~ 7/14
24*	(SHIFT) F12	CSI 9/11	4 3/4	9 3/9	~ 7/14

Named Function Keys   **7.5.3.3** The 924 VDT provides special-purpose keys used for editing and for controlling various terminal functions. The codes transmitted by the special keys are shown in Table 7-11. Certain special-purpose key codes can be changed by the programmer or operator. The keys that can be user-defined are noted by an asterisk.

Table 7-11

Named Function Key Codes

Function Key	924 Key Sequence	Transmitted Sequence			
PRINT	PRINT	CSI 9/11	3 3/3	4 3/4	~ 7/14
RETURN	RETURN	CR 0/13			
TAB	TAB	TAB 0/9			
BACK TAB	(SHIFT) TAB	CSI 9/11	Z 5/10		
ENTER*	ENTER	CSI 9/11	1 3/1	~ 7/14	
INSERT CHAR	INS	CSI 9/11	@ 4/0		
DELETE CHAR	DEL	CSI 9/11	P 5/0		
RIGHT FIELD	(ALT) right arrow	CSI 9/11	6 3/6	~ 7/14	
LEFT FIELD	(ALT) left arrow	CSI 9/11	5 3/5	~ 7/14	
COMMAND	CMD	CSI 9/11	2 3/2	9 3/9	~ 7/14
ESCAPE	ESC	ESC 1/11			
ESCAPE EVENT	(SHIFT) ESC	CSI 9/11	3 3/3	1 3/1	~ 7/14
HOLD/ATTN FUNCT*	ATTN	CSI 9/11	2 3/2	8 3/8	~ 7/14
SKIP	(ALT) = (NUM)	CSI 9/11	3 3/3	2 3/2	~ 7/14
ERASE FIELD	(ALT) + (NUM)	CSI 9/11	7 3/7	~ 7/14	

Table 7-11

Named Function Key Codes (Continued)				
Function Key	**924 Key Sequence**	**Transmitted Sequence**		
ERASE INPUT	(ALT) DEL	CSI 9/11	3 3/3	~ 7/14
INSERT LINE	(SHIFT) INS	CSI 9/11	L 4/12	
DELETE LINE	(SHIFT) DEL	CSI 9/11	M 4/13	
SEND*	SEND	CSI 9/11	4 3/4	~ 7/14

Auto-Repeat Keys

7.5.4 The keys used for normal key entry on the 924 VDT have an automatic repeat feature. When you press and hold a key, that character is entered repeatedly at a rate of 10 characters per second until you release the key. All keys repeat except the following:

■ Function keys F1 through F12

■ ATTN

■ Break

■ Print

■ Send

■ CTRL

■ Caps Lock

■ ALT

■ Shift

■ Enter

■ Compose Character

■ Degree/umlaut

924 VDT Receive Character Processing

7.6 The 924 VDT processes the following types of character codes when it receives them from a host computer or application program.

- **Graphic character codes.** Graphic character codes cause symbols to be displayed or printed. The majority of received codes processed by the 924 VDT consist of graphic character codes.

- **Control character codes.** The control character codes processed by the 924 VDT include the single-byte C0 control characters standardized by ISO 646, and the C1 control characters described in ISO 2022 and ISO 6429. These control characters are used for formatting, communications, and code extension functions.

- **Escape sequences.** Escape sequences are standardized by ISO 2022 for code extension functions in both the 7-bit and 8-bit code tables. Code extension functions include character set designation and character set invocation using shift functions. Escape sequences are introduced by the C0 character ESC (1/11) and terminated by final characters which determine the particular function performed.

- **Control sequences.** The control functions processed by the 924 VDT are standardized by ISO 6429. These control functions are introduced by the C1 character Control Sequence Introducer (CSI 9/11), or its 7-bit equivalent (1/11 5/11). Control functions for VDTs include editing functions, formatting functions, and miscellaneous functions for defining operating modes.

- **Device control strings.** Device control strings are introduced by the C1 character Device Control String (DCS 9/0), or its 7-bit equivalent (1/11 5/0). Device control strings are used by the 924 VDT to define user-definable VDT attributes such as user-defined keys and dynamically redefinable character sets.

The control characters and functions implemented by the 924 VDT are standardized and named by ISO. These functions are referred to by their ISO standard mnemonics (abbreviations) in this section. A listing of the mnemonics used in this section is provided in Appendix F.

7.6.1 The 924 VDT performs certain actions when it receives a CO control code. Table 7-12 lists the actions associated with each code.

Table 7-12 Actions Taken Upon Receipt of CO Control Codes

CO Control Code	Mnemonic	Code	924 VDT Action
Null	NUL	0/00	Ignored
Start of header	SOH	0/01	Ignored
Start of text	STX	0/02	Ignored
End of text	ETX	0/03	Ignored
End of transmission	EOT	0/04	Ignored
Enquiry	ENQ	0/05	Transmits answerback defined in set-up
Bell	BEL	0/07	Rings audible alarm bell
Backspace	BS	0/08	Moves the active cursor position one character to the left. If the cursor is at the left margin, no action is taken.
Horizontal tab	HT	0/09	Moves the active cursor position to the next tab stop on the line, or to the right margin if no tabs are defined.
Line feed	LF	0/10	If Line Feed/New Line mode=line feed, then moves the cursor down one row. If Line Feed/New Line mode=new line, then moves cursor to the left margin of the next row.
Vertical tab	VT	0/11	Same function as Line Feed
Form feed	FF	0/12	Same function as Line Feed
Carriage return	CR	0/13	Moves the cursor to the left margin on the current row.
Shift out	SO	0/14	Invokes G1 character set into GL code positions.
Shift in	SI	0/15	Invokes G0 character set into GL code positions.
Data line escape	DLE	1/00	Ignored
Device control 1	DC1	1/01	IF XON/XOFF handshaking is selected in set-up, DC1 causes the 924 to resume data transmission. DC1 is ignored otherwise.
Device control 2	DC2	1/02	Ignored

Table 7-12 Actions Taken Upon Receipt of C0 Control Codes (Continued)

C0 Control Code	Mnemonic	Code	924 VDT Action
Device control 3	DC3	1/03	IF XON/XOFF handshaking is selected in set-up, DC3 causes the 924 to stop transmitting data until a DC1 is received. DC3 is ignored otherwise.
Device control 4	DC4	1/04	Ignored
Negative acknowledgement	NAK	1/05	Ignored
Synchronous idle	SYN	1/06	Ignored
End of text block	ETB	1/07	Ignored
Cancel	CAN	1/08	If CAN occurs in the middle of a control sequence that starts with ESC, CSI or DCS, it cancels the function. Ignored otherwise.
End of media	EM	1/09	Ignored
Substitute	SUB	1/10	If SUB occurs in the middle of a control sequence that starts with ESC, CSI or DCS, it cancels the function and displays a reverse ?.
Escape	ESC	1/11	Initiates a control function. If ESC is received in the middle of a control function, it terminates the control function.
File separator/IS4	FS/IS4	1/12	Ignored
Group separator/IS3	GS/IS3	1/13	Ignored
Record separator/IS2	RS/IS2	1/14	Ignored
Unit separator/IS1	US/IS1	1/15	Ignored
Delete	DEL	7/15	Ignored

C1 Control Code
Actions

7.6.2 The C1 control codes provide additional communication, character extension, editing, and formatting functions. Table 7-13 lists the actions taken by the 924 VDT when it receives a C1 code.

Table 7-13 Actions Taken Upon Receipt of C1 Control Codes

C1 Control Functions	Mnemonic	Code	924 VDT Action
	–	8/00	Ignored
	–	8/01	Ignored
Break permitted here	BPH	8/02	Ignored
No break here	NBH	8/03	Ignored
Index	IND	8/04	Moves the active cursor position down one row. If the active cursor position is on the bottom margin, the screen scrolls up one row.
Next line	NEL	8/05	Moves the active cursor position to the left margin on the next row. If the active cursor position is on the bottom margin, the screen scrolls up one row.
Start of selected area	SSA	8/06	Ignored
End of selected area	ESA	8/07	Ignored
Horizontal tab set	HTS	8/08	Sets a horizontal tab stop in the column which corresponds to the active cursor position.
Horizontal tab with justify	HTJ	8/09	Ignored
Line tabulation set	VTS	8/10	Ignored
Partial line down	PLD	8/11	Ignored
Partial line up	PLU	8/12	Ignored
Reverse index	RI	8/13	Moves the active position to the corresponding character position in the preceding row. If the active cursor position is on the top margin, the screen scrolls up one row.
Single shift 2	SS2	8/14	Invokes the G2 character set into GL for a single character.
Single shift 3	SS3	8/15	Invokes the G3 character set into GL for a single character.

Table 7-13 Actions Taken Upon Receipt of C1 Control Codes (Continued)

C1 Control Functions	Mnemonic	Code	924 VDT Action
Device control string	DCS	9/00	DCS is used to delimit the beginning of a string for use in device control. The ST control function is used to terminate a device control string.
Private use 1	PU1	9/01	Ignored
Private use 2	PU2	9/02	Ignored
	–	9/03	Ignored
Cancel character	CCH	9/04	Ignored
Message waiting	MW	9/05	Ignored
	–	9/06	Ignored
	–	9/07	Ignored
Start of string	SOS	9/08	SOS is used to delimit a character string of arbitrary content except for the characters which correspond to ST or SOS. The ST control function is used to terminate a string started by SOS.
	–	9/09	Ignored
	–	9/10	Ignored
Control seq. introducer	CSI	9/11	CSI is the first character of a control sequence.
String terminator	ST	9/12	ST is used as the terminating delimiter for strings started by DCS or SOS.
Operating system command	OSC	9/13	Ignored
Privacy message	PM	9/14	Ignored
Application program command	APC	9/15	Ignored

7.6.3 An application can select exactly which elements of the 924 VDT's graphic repertoire that it wishes to use. The control sequences used in this selection are called SCS (select character set), and the selection process is referred to as character set designation. The 924 VDT's graphic repertoire includes both predefined *(hard)* character sets and the Dynamically Redefinable *(soft)* Character Set, as noted in paragraph 7.4.3.6. The structure of the names used for character sets is defined by ISO 2022. The codes used as final characters for the hard character sets in the 924 VDT repertoire are given in Table 7-14.

Table 7-14

Final Characters for Hard Character Sets

Graphic Character Set	Attributes	Final Character
USASCII	94 characters	B 4/2
UKASCII	94 characters	A 4/1
VT100 Graphics	94 characters	0 3/0
931 Graphics	94 characters	1 3/1
8859/1 Multinational	96 characters	B 4/2

The SCS control functions are three-character escape sequences of the form,

ESC   I   F
1/11

where I is an intermediate byte and F is a final byte from Table 7-14. The intermediate byte value, I, selects the label (G0, G1, G2, or G3) to be used by the terminal in processing the character set. Graphic character sets are G0, G1, G2, and G3. The set of valid intermediate characters and their corresponding meanings are listed in Table 7-15.

Table 7-15

Intermediate Characters for SCS Sequence

Meaning	Intermediate Byte
Designate 94-byte character set into G0 (Assign label G0 to character set F)	(2/8
Designate 94-byte character set into G1 (Assign label G1 to character set F)	) 2/9
Designate 94-byte character set into G2 (Assign label G2 to character set F)	* 2/10
Designate 94-byte character set into G3 (Assign label G3 to character set F)	+ 2/11

Table 7-15

Intermediate Characters for SCS Sequence (Continued)

Meaning	Intermediate	Byte
Designate 96-byte character set into G1 (Assign label G1 to character set F)	–	2/13
Designate 96-byte character set into G2 (Assign label G2 to character set F)	.	2/14
Designate 96-byte character set into G3 (Assign label G3 to character set F)	/	2/15

The 924 VDT implements default designations which alleviate the need for SCS sequences in many applications. The defaults in the 924 VDT that are set on power-up are listed in Table 7-16.

Table 7-16

Designation Defaults

Label	Default Character Set
G0	USASCII
G1	VT100 Special Graphics
G2	8859/1 Multinational
G3	931 Line Drawing Graphics

As an example of how the designation sequences are constructed, the following paragraphs illustrate the escape sequences that would be used to restore the default designations.

USASCII is labeled G0. The final character from Table 7-14 for USASCII is B. USASCII consists of 94 graphic symbols. The intermediate byte used to designate a 94-byte character set into G0 from Table 7-15 is (from code table position 2/8. Thus the sequence to designate USASCII into G0 is:

ESC	(	B
1/11	2/8	4/2

VT100 Special Graphics is labeled G1. The final character from Table 7-14 for VT100 Special Graphics is 0. VT100 Special Graphics consists of 94 graphic symbols. The intermediate byte used to designate a 94-byte character set into G1 from Table 7-15 is) from code table position 2/9. Thus the sequence to designate VT100 Special Graphics into G1 is:

ESC	)	0
1/11	2/9	3/0

8859/1 Multinational Graphics is labeled G2. The final character from Table 7-14 for 8859/1 Graphics is B. 8859/1 Graphics consists of 96 graphic symbols. The intermediate byte used to designate a 96-byte character set into G2 from Table 7-15 is . from code table position 2/14. Thus the sequence to designate 8859/1 graphics into G2 is:

```
ESC    .      B
1/11   2/14   4/2
```

931 Graphics is labeled G3. The final character from Table 7-14 for 931 Graphics is 1. 931 Graphics consists of 94 graphic symbols. The intermediate byte used to designate a 94-byte character set into G3 from Table 7-15 is + from code table position 2/11. Thus the sequence to designate 931 Graphics into G3 is:

```
ESC    +      1
1/11   2/11   3/1
```

The DRCS is a soft character set that is defined by a programmer and downloaded into the terminal using a device control string as defined in paragraph 7.4.3.6. All DRCSs currently implemented by the 924 VDT are 94-byte graphic sets. They can be used to supplement the hard character sets or to replace them.

A DRCS is assigned a character string for use in the SCS sequence at the time it is downloaded. The general format of the DRCS selector is from zero to two intermediate bytes followed by a final byte. The intermediate bytes may take values from 2/0 through 2/15, where the value 2/0 identifies a DRCS. Final bytes may take values from 3/0 to 7/14. Some examples of the character set selection strings used with dynamic character sets and their meanings are listed in the following table.

ESC	I	I...I	F	Meaning
1/11	2/10	2/0	4/0	An unregistered DRCS character set
ESC	*	space	@	designated into G2. (This value is recommended for users wanting to augment the VDT graphic repertoire.)
1/11	2/11		3/1	A non-standardized graphic character
ESC	+		1	set which replaces 931 Graphics.
1/11	2/8		4/2	A standardized character set which
ESC	(		B	replaces the USASCII graphic set.

Character Set Invocation

7.6.4 Once character sets are labeled, they may be invoked into particular bit combinations for use. There are two mechanisms for invoking character sets. Locking shifts are used to map the character sets for an indefinite amount of time. Single shifts are used to map the character sets for only a single graphic character. These invoking mechanisms are described in the following paragraphs.

Locking Shifts   **7.6.4.1** Locking shift functions are used to invoke the numbered graphic character labels (G0, G1, G2, or G3) into either the Graphic left (GL) or Graphic right (GR) positions of the code table. The locking shift functions implemented by the 924 VDT are listed in Table 7-17.

Table 7-17

Locking Shift Functions

Shift Function Name	Coding	Function	Columns in Code Table
Lock shift zero	LS0 0/15	Invoke G0 into GL (default)	2 – 7
Lock shift one	LS1 0/14	Invoke G1 into GL	2 – 7
Lock shift two	LS2 1/11 6/14	Invoke G2 into GL	2 – 7
Lock shift three	LS3 1/11 6/15	Invoke G3 into GL	2 – 7
Lock shift one right	LS1R 1/11 7/14	Invoke G1 into GR	10 – 15
Lock shift two right	LS2R 1/11 7/13	Invoke G2 into GR (default)	10 – 15
Lock shift three right	LS3R 1/11 7/12	Invoke G3 into GR	10 – 15

Note that, by default, G0 is invoked into GL and G2 is invoked into GR. These assignments, together with the default designations from Table 7-16, cause USASCII to be assigned to the code table columns 2 through 7, and 8859/1 Multinational graphics assigned to code table columns 10 through 15.

Single Shifts   **7.6.4.2** Single shifts provide access to G2 and G3 character sets for a single graphic character. When the VDT receives a single shift function, it processes the next sequential character as if it were from the specified character set, then returns to the previously invoked character sets for all subsequent characters.

The Single Shift 2 (SS2) function causes the GL bit combination following it to be interpreted according to the currently designated G2 character set. The SS2 function can be encoded as either a 7-bit or 8-bit control function, as shown below:

Function	7-Bit Coding		8-Bit Coding
Single Shift 2 (SS2)	1/11 ESC	4/14 N	8/14 SS2

The Single Shift 3 (SS3) function causes the GL bit combination following it to be interpreted according to the currently designated G3 character set. The SS3 function can be encoded as either a 7-bit or 8-bit control function, as shown below:

Function	7-Bit Coding		8-Bit Coding
Single Shift 3	1/11	4/15	8/15
(SS3)	ESC	O	SS3

As an example of usage of single shift functions, a programmer may wish to access the 8859/1 Multinational graphic symbol for the fraction ½ in a 7-bit environment. Using the 924 VDT default designations, 8859/1 is designated as G2. The GR bit combination for the ½ character is 11/13, but if invoked into GL, this character would be 2/13. The SS2 function allows the programmer to invoke a single character from G2 into GL. Thus the programmer would send the following function to display the ½ character on the VDT:

1/11	4/14	2/13
ESC	O	=

7-Bit and 8-Bit Modes   **7.6.5**   The 924 VDT supports both 7-bit and 8-bit communication modes with host computers. You can use code extension announcement functions of ISO 2022 to control the representation of the C1 control characters transmitted by the 924 VDT. Two such announcement functions are supported: S7C1T and S8C1T.

NOTE: The 924 VDT will correctly process C1 control characters in either their 8-bit format (single characters from columns 8 and 9 of the code table), or their 7-bit format (ESC Fe, where Fe is a final character from columns 4 and 5 of the code table).

Select 7-Bit Controls   **7.6.5.1**   If the host or application program expects C1 control characters to be represented in their 7-bit format as ESC Fe, use the following escape sequence.

Select 7-bit C1 Transmission	1/11	2/0	4/6
(S7C1T)	ESC	space	F

You can also select 7-bit format from the 924 VDT General Set-Up screen.

Select 8-Bit Controls   **7.6.5.2**   If the host or application program expects C1 control characters to be represented in their 8-bit format, use the following escape sequence.

Select 8-bit C1 Transmission	1/11	2/0	4/7
(S8C1T)	ESC	space	G

You can also select 8-bit format from the 924 VDT General Set-Up screen.

Terminal Modes

7.6.6 The 924 VDT incorporates certain parameters, called *modes*, which affect the way the terminal transmits, receives, displays, or prints data. The 924 VDT supports ANSI/ISO-standardized modes for common operating variations and ANSI/ISO-compatible private modes for operations unique to the 924 VDT or other terminal devices.

Each mode has two states: the Set state and the Reset state. These states are modified using the Set Mode and Reset Mode control sequences. One or more modes can be addressed by each Set Mode or Reset Mode control sequence.

Initial values for certain modes can be specified with the set-up screens. These mode settings can be changed by host computer applications. Several modes are designated as user-preference features. These features can be locked via the General Set-Up screen, thereby preventing the host computer from changing the settings.

An example of a mode with an initial value is the Text Cursor Enable mode (TCEM). The value of this mode is derived from the CURSOR/NO CURSOR parameter on the Display Set-Up screen. Certain hosts and application programs use the Set/Reset Mode control sequences to specify whether or not the cursor is to be displayed on the screen.

Set Mode (SM)

7.6.6.1 The Set Mode control sequence is used to set one or more ANSI/ISO standard or ANSI/ISO-compatible private modes to the Set state. The Set Mode control sequence has the following format.

Set Mode	9/11	Ps	6/8
(SM)	CSI		h

The selective parameter denoted by Ps identifies the particular mode to be initialized to the Set state. To address a group of modes in the Set Mode control sequence, separate the mode parameters by a semicolon (3/11). ANSI/ISO standard modes and private modes should not be mixed in the same Set Mode control sequence. The Ps parameter values for ANSI/ISO standard modes are listed in Table 7-18.

Reset Mode (RM)

7.6.6.2 The Reset Mode control sequence is used to set one or more ANSI/ISO standard or private modes to the Reset state. The Reset Mode control sequence has the following format.

Reset Mode	9/11	Ps	6/12
(RM)	CSI		l

The selective parameter denoted by Ps identifies the particular mode to be initialized to the Reset state. You can group modes within a single Reset Mode control sequence; however, you cannot mix ANSI/ISO standard modes and private modes within the same Reset Mode control sequence.

ANSI/ISO Standard
Modes

7.6.6.3 The 924 VDT supports five ANSI/ISO standard modes as defined by ISO 6429.2. These modes are listed in Table 7-18. Selective parameters used to specify standard modes are encoded in decimal ASCII.

Table 7-18

ANSI/ISO Standard Modes Supported

Mode Name	Mnemonic	Set/Reset Parameter	User Preference
Keyboard Action mode	KAM	2	Yes
Insert/Replace mode	IRM	4	No
Send/Receive mode	SRM	12	No
Line Feed/Newline mode	LNM	20	No
Steady/Blink Cursor mode	CURM	33	No

■ **Keyboard Action mode (KAM).** Keyboard Action mode allows host applications to lock and unlock the terminal keyboard. When the keyboard is locked, the keyclick feature is disabled, which indicates that keys entered will not be sent to the host computer. The default for Keyboard Action mode is RESET=keyboard unlocked.

The Set state of KAM is keyboard locked. Use the following Set Mode control sequence to lock the keyboard.

Set Mode (Lock Keyboard)	9/11	3/2	6/8
(SM-KAM)	CSI	2	h

To unlock the keyboard from the host, use the following Reset Mode control sequence.

Reset Mode (Unlock Keyboard)	9/11	3/2	6/12
(RM-KAM)	CSI	2	l

Keyboard Action mode is a user-preference feature. It can be locked via the General Set-Up screen to prevent host applications from locking the terminal keyboard. If user-preference features are locked, the Set Mode or Reset Mode control sequence used to modify the state of Keyboard Action mode is ignored by the terminal.

■ **Insert/Replace mode (IRM).** Insert/Replace mode affects how the terminal displays received characters on the screen.

In Insert mode, the terminal displays each graphic character received at the active cursor position and moves the character under the cursor and all characters to the right of the cursor one position to the right. Data that is moved beyond the right margin is discarded. The cursor is moved right one character after the new character is displayed.

In Replace mode, the terminal displays each graphic character received at the active cursor position, overwriting the character previously displayed. The cursor is moved right one character after the new character is displayed.

The default is RESET=replace mode.

The Set state of IRM is Insert mode. Use the following Set Mode control sequence to select Insert mode.

Set Mode (Insert Mode)	9/11	3/2	6/8
(SM-IRM)	CSI	4	h

The Reset state of IRM is Replace mode. Use the following Reset Mode control sequence to select Replace mode.

Reset Mode (Replace Mode)	9/11	3/2	6/12
(RM-IRM)	CSI	4	l

■ **Send/Receive Mode (SRM).** Send/Receive mode allows host applications to control the local echo terminal function. If local echo is on, then characters typed on the keyboard are automatically displayed on the screen. If local echo is off, the host computer must echo characters it receives back to the terminal for the characters to be displayed on the screen.

The initial value is determined by the LOCAL ECHO/NO LOCAL ECHO parameter setting on the Communications Set-Up screen.

The Set state of SRM is no local echo (full duplex mode). Use the following Set Mode control sequence to disable local echo.

Set Mode (No local Echo)	9/11	3/1	3/2	6/8
(SM-SRM)	CSI	1	2	h

Use the following Reset Mode control sequence to enable local echo from the host.

Reset Mode (Local echo)	9/11	3/1	3/2	6/12
(RM-SRM)	CSI	1	2	l

■ **Line Feed/New Line (LNM).** Line Feed/New Line mode determines which characters are transmitted by the Return key. It also affects processing for form feed (FF), line feed (LF), and vertical tab (VT) control characters received from the host. The initial value is determined by the NEW LINE/NO NEW LINE parameter setting on the General Set-Up screen.

In New Line mode, the Return key transmits both carriage return (0/13) and line feed (0/10) codes. When the 924 VDT receives an FF, LF, or VT control character from the host in New Line mode, the cursor moves to the first column of the next line.

In Line Feed mode, the Return key transmits only a carriage return (0/13) code. When the 924 VDT receives an FF, LF, or VT control character from the host in Line Feed mode, the cursor moves to the current column of the next line.

The Set state of Line Feed/New Line mode is New Line mode. Use the following Set Mode control sequence to enable New Line mode.

Set Mode (New line mode)	9/11	3/2	3/0	6/8
(SM-LNM)	CSI	2	0	h

The Reset state of Line Feed/New Line mode is Line Feed mode. Use the following Reset Mode control sequence to disable New Line mode.

Reset Mode (Line feed mode)	9/11	3/2	3/0	6/12
(RM-LNM)	CSI	2	0	l

■ **Steady/Blink Cursor (CURM).** Steady/Blink Cursor mode determines how the cursor is displayed on the VDT screen. The cursor can be either steady or blinking. The initial value is determined by the STEADY/BLINK-ING CURSOR parameter setting on the Display Set-Up screen.

The Set state of Steady/Blink Cursor mode displays a steady cursor. Use the following Set Mode control sequence to set the cursor to steady.

Set Mode (Cursor Steady)	9/11	3/3	3/3	6/8
(SM-CURM)	CSI	3	3	h

The Reset state of Steady/Blink Cursor mode displays a blinking cursor. Use the following Reset Mode control sequence to cause the cursor to blink.

Reset Mode (Cursor Blinking)	9/11	3/2	3/0	6/12
(RM-CURM)	CSI	3	3	l

ANSI/ISO-Compatible Private Modes

7.6.6.4 The 924 VDT supports twelve ANSI/ISO-compatible private modes. Private mode parameters are introduced by the ASCII question mark character (3/15) with decimal ASCII parameters. The private modes are listed in Table 7-19.

Table 7-19

ANSI/ISO-Compatible Private Modes Supported

Mode Name	Mnemonic	Set/Reset Parameter	User Preference
Column Select	COLM	? 3	No
Scroll Select	SCLM	? 4	Yes
Screen Mode	SCNM	? 5	Yes
Origin	OM	? 6	No
Auto Wrap	AWM	? 7	No
Auto Repeat	ARM	? 8	Yes
Printer Form Feed	PFF	? 1 8	No
Printer Extent	PEX	? 1 9	No
Text Cursor Enable	TCEM	? 2 5	No
MC Transmit Host Attributes	MCXHA	? 5 0	No
MC Transmit Print Controls	MCXPC	? 5 1	No
MC Transmit Host Controls	MCXHC	? 5 2	No

■ **Column Select (COLM).** Column Select mode determines the width of the screen display. The screen can be formatted for either 80 columns or 132 columns per line. The initial value is determined by the 80 COLUMN/132 COLUMN parameter setting on the Display Set-Up screen.

NOTE: The 924 VDT does not preserve data on the screen when the column format of the screen is changed. When a Set Mode or Reset Mode control sequence which changes the format is received, the screen is erased, the cursor is positioned at the home position, and the scrolling region is set to the full screen.

The Set state of Column Select mode is 132 columns per line. Use the following Set Mode control sequence to select 132 columns per line.

Set Mode (132 columns)	9/11	3/15	3/3	6/8
(SM-COLM)	CSI	?	3	h

The Reset state of Column Select mode is 80 columns per line. Use the following Reset Mode control sequence to select 80 columns per line.

Reset Mode (80 columns)	9/11	3/15	3/3	6/12
(RM-COLM)	CSI	?	3	l

■ **Scroll Select (SCLM).** Scroll Select mode selects the type of scrolling used by the terminal for operations which cause scrolling to occur. Scroll Select mode can be set to scroll on a character basis (jump scroll), or on a pixel basis (smooth scroll) at a rate of 6 pixel lines per second. The initial value is determined by the SMOOTH SCROLL/JUMP SCROLL parameter setting on the Display Set-Up screen.

The Set state of Scroll Select mode is smooth scroll. Use the following Set Mode control sequence to select smooth scroll.

Set Mode (smooth scroll)	9/11	3/15	3/4	6/8
(SM-SCLM)	CSI	?	4	h

The Reset state of Scroll Select mode is jump scrolling. Use the following Reset Mode control sequence to select jump scrolling.

Reset Mode (jump scroll)	9/11	3/15	3/4	6/12
(RM-SCLM)	CSI	?	4	l

Scroll Select mode is a user-preference feature. It can be locked via the General Set-Up Screen to prevent host applications from modifying the scroll setting. If user-preference features are locked, the Set Mode or Reset Mode control sequence used to modify the state of Scroll mode is ignored by the terminal.

■ **Screen mode (SCNM).** Screen mode selects either light characters on a dark background (normal display) or dark characters on a light background (reverse video). The initial value is determined by the NORMAL VIDEO/ REVERSE VIDEO parameter setting on the Display Set-Up screen.

The Set state of Screen mode is reverse video. Use the following Set Mode control sequence to select reverse video.

Set Mode (reverse video)	9/11	3/15	3/5	6/8
(SM-SCNM)	CSI	?	5	h

The Reset state of Screen mode is normal video. Use the following Reset Mode control sequence to select normal video.

Reset Mode (normal video)	9/11	3/15	3/5	6/12
(RM-SCNM)	CSI	?	5	l

Screen mode is a user-preference feature. It can be locked via the General Set-Up Screen to prevent host applications from modifying the screen setting. If user-preference features are locked, the Set Mode or Reset Mode control sequence used to modify the state of Screen mode is ignored by the terminal.

■ **Origin (OM).** Origin mode affects the organization of the screen display and the action of the control sequences used to move the cursor. Cursor addressing can be made to be independent of the scrolling region, or made relative to the scrolling region. The default value is RESET=absolute cursor addressing.

The Set state of Origin mode means that cursor addressing is relative to the top line of the scrolling region. Thus, a reference to line 1 in a cursor position control sequence refers to the top line of the scrolling region. Use the following Set Mode control sequence to make cursor addressing relative to the scrolling region.

Set Mode (scroll region origin)	9/11	3/15	3/6	6/8
(SM-OM)	CSI	?	6	h

The Reset state of Origin mode means that cursor addressing is absolute. Thus, a reference to line 1 in a cursor position control sequence refers to the top line of the screen. Use the following Reset Mode control sequence to select absolute cursor addressing.

Reset Mode (Absolute origin)	9/11	3/15	3/6	6/12
(RM-OM)	CSI	?	6	l

■ **Auto Wrap (AWM).** Auto Wrap mode affects how received graphic characters are displayed when the cursor is at the right margin. The initial value is determined by the AUTO WRAP/NO AUTO WRAP parameter setting on the Display Set-Up screen.

When auto wrap is enabled, graphic characters received by the VDT when the cursor is at the right margin are displayed on the next line. If the auto wrap operation causes the cursor to move to the end of the scrolling region, the display automatically scrolls up one line.

When auto wrap is disabled, graphic characters received by the VDT when the cursor is at the right margin over-write previously received data. The cursor position does not change.

The Set state of Auto Wrap mode is auto wrap enabled. Use the following Set Mode control sequence to enable Auto Wrap mode.

Set Mode (Enable auto wrap)	9/11	3/15	3/7	6/8
(SM-AWM)	CSI	?	7	h

The Reset state of Auto Wrap mode is auto wrap disabled. Use the following Reset Mode control sequence to disable auto wrap.

Reset Mode (Disable auto wrap)	9/11	3/15	3/7	6/12
(RM-AWM)	CSI	?	7	l

■ **Auto Repeat (ARM).** Auto Repeat mode affects keyboard character entry. The initial value is determined by the AUTO REPEAT/NO AUTO REPEAT parameter setting on the Keyboard Set-Up screen.

When auto-repeat is enabled, a key which is held down for more than 0.5 seconds is repeatedly transmitted to the host until the key is released.

The Set state of Auto Repeat mode is auto-repeat enabled. Use the following Set Mode control sequence to enable auto-repeat.

Set Mode (Enable auto repeat)	9/11	3/15	3/8	6/8
(SM-ARM)	CSI	?	8	h

The Reset state of Auto Repeat mode is auto-repeat disabled. Use the following Reset Mode control sequence to disable auto-repeat.

Reset Mode (Disable auto repeat)	9/11	3/15	3/8	6/12
(RM-ARM)	CSI	?	8	l

Auto Repeat mode is a user-preference feature. It can be locked via the General Set-Up screen to prevent host applications from modifying the auto-repeat setting. If user-preference features are locked, the Set Mode or Reset Mode control sequence used to modify the state of Auto Repeat is ignored by the terminal.

■ **Printer Form Feed (PFF).** Printer Form Feed mode affects the media copy print screen control sequence. The initial value is determined by the TERMINATOR=FF/NO TERMINATOR parameter setting on the Printer Set-Up screen.

The Set state of Printer Form Feed mode causes a form feed character to be transmitted to the printer at the end of the screen data. Use the following Set Mode control sequence to cause the application to use this print termination character.

Set Mode (Use print terminator)	9/11	3/15	3/1	3/8	6/8
(SM-PFF)	CSI	?	1	8	h

The Reset state of Printer Form Feed mode is that no print termination character is used. Use the following Reset Mode control sequence to cause the application to omit the print termination character.

Reset Mode (no print terminator)	9/11	3/15	3/1	3/8	6/12
(RM-PFF)	CSI	?	1	8	l

■ **Printer Extent (PEX).** Print Extent mode affects the media copy print screen control sequence. The initial value is determined by the PRINT FULL PAGE/PRINT SCROLL REGION parameter setting on the Printer Set-Up screen.

The Set state of Printer Extent mode is to print the full screen on a print screen request. Use the following Set Mode control sequence to enable full screen printing.

Set Mode (Print Full Screen)	9/11	3/15	3/1	3/9	6/8
(SM-PEX)	CSI	?	1	9	h

The Reset state of Print Extent mode is to print only the scrolling region of the screen during a print screen operation. Use the following Reset Mode control sequence to limit print screen operations to the scrolling region.

Reset Mode (Print scroll region)	9/11	3/15	3/1	3/9	6/12
(RM-PEX)	CSI	?	1	9	l

■ **Cursor Display (TCEM).** Text Cursor Enable mode determines whether the cursor is displayed on the VDT screen. The initial value is determined by the CURSOR/NO CURSOR parameter setting on the Display Set-Up screen.

The Set state of Text Cursor Enable mode causes the cursor to be displayed on the screen. Use the following Set Mode control sequence to display the cursor.

Set Mode (Cursor Enable)	9/11	3/15	3/2	3/5	6/8
(SM-TCEM)	CSI	?	2	5	h

The Reset state of Text Cursor Enable mode is cursor not displayed. Use the following Reset Mode control sequence to hide the cursor.

Reset Mode (Cursor Disable)	9/11	3/15	3/2	3/5	6/12
(RM-TCEM)	CSI	?	2	5	l

■ **Media Copy Transmit Host Attributes (MCXHA).** MCXHA mode affects the 924 VDT's response to the media copy read screen and read row control sequences. This mode determines whether the host application program reads only the data characters on the screen, or both the data characters and the graphic rendition control sequences. The default is RESET= attributes not transmitted to the host.

The Set state of MCXHA mode is to transmit the Select Graphic Rendition (SGR) control sequences within the character string sent to the host. Use the following Set Mode control sequence:

Set Mode (Xmit host	9/11	3/15	3/5	3/0	6/8
attributes) (SM-MCXHA)	CSI	?	5	0	h

The Reset state of MCXHA mode is to transmit only screen graphic characters and formatting characters within the character string sent to the host. Use the following Reset Mode control sequence:

Reset Mode (Xmit no host	9/11	3/15	3/5	3/0	6/12
attributes) (RM-MCXHA)	CSI	?	5	0	l

■ **Media Copy Transmit Print Controls (MCXPC).** MCXPC mode affects the 924 VDT's response to the media copy print screen and print line control sequences. This mode allows flexibility in the type of printers used on the terminal's printer port.

The initial value is determined by the Print Data Type field of the Printer Set-Up screen. If PRINT DATA=ASCII/UK or Extended Data, the mode is Reset. If PRINT DATA=Extended Controls, the mode is Set.

The Set state of MCXPC mode causes designation sequences and invocation sequences to be transmitted along with the screen data to the printer. Use the following Set Mode control sequence:

Set Mode (Xmit print	9/11	3/15	3/5	3/1	6/8
controls) (SM-MCXPC)	CSI	?	5	1	h

The Reset state of MCXPC mode causes only screen graphic characters and formatting characters to be transmitted within the character string sent to the printer. Use the following Reset Mode control sequence:

Reset Mode (Xmit no print	9/11	3/15	3/5	3/1	6/12
controls) (RM-MCXPC)	CSI	?	5	1	l

■ **Media Copy Transmit Host Controls (MCXHC).** MCXHC mode affects the 924 VDT's response to the media copy read screen and read row control sequences. This mode determines whether the host application program reads only the data characters on the screen, or both the data characters and the control sequences used to designate and invoke the character sets in use. The default is RESET=controls not transmitted to the host.

The Set state of MCXHC causes designation sequences and invocation sequences to be transmitted along with the screen data. Use the following Set Mode control sequence:

Set Mode (Xmit host	9/11	3/15	3/5	3/2	6/8
controls) (SM-MCXHC)	CSI	?	5	2	h

The Reset state of MCXHC mode causes only screen graphic characters and formatting characters to be transmitted within the character string sent to the host. Use the following Reset Mode control sequence:

Reset Mode (Xmit no host	9/11	3/15	3/5	3/2	6/12
controls) (RM-MCXHC)	CSI	?	5	2	l

Mode Setting Examples

7.6.6.5 An application can address multiple modes in a Set Mode or Reset Mode control sequence. However, ANSI/ISO-compatible private and ANSI/ISO standard modes cannot be mixed in a single sequence. The following examples illustrate rules used in combining modes.

1. An application is to blink the cursor and unlock the keyboard. The following control sequence is needed.

9/11	3/2	3/11	3/3	3/3	6/12
CSI	2	;	3	3	l

A single Reset mode can be used because both modes are standard ANSI/ISO modes.

2. An application is to blink the cursor and lock the keyboard. The following control sequence is needed.

9/11	3/2	6/8	9/11	3/3	3/3	6/12
CSI	2	h	CSI	3	3	l

Both Set mode and a Reset mode sequence must be used.

3. An application is to disable auto-repeat mode from the keyboard and turn the cursor off.

9/11	3/15	3/8	3/11	3/2	3/5	6/12
CSI	?	8	;	2	5	l

A single Reset mode can be used because both modes are private. A single question mark can be used since all mode parameters following the question mark are private.

Cursor Control Commands

7.6.7 The cursor indicates the position on the VDT screen. The following commands affect cursor positioning and control.

NOTE: If the value for Pn is 0, or the Pn parameter is omitted, the terminal will default to $Pn=1$.

■ **Cursor Backward (CUB).** Moves the active position to the left Pn columns, where Pn is a selective numeric parameter. The cursor stops at the left margin. The format of the cursor backward command is provided below:

Cursor Backward	9/11		4/4
(CUB)	CSI	Pn	D

■ **Cursor Forward (CUF).** Moves the active position to the right Pn columns, where Pn is a selective numeric parameter. The cursor stops at the right margin.

Cursor Forward	9/11		4/3
(CUF)	CSI	Pn	C

■ **Cursor Up (CUU).** Moves the active position up Pn lines, where Pn is a selective numeric parameter. The cursor stops at the top margin.

Cursor Up	9/11		4/1
(CUU)	CSI	Pn	A

■ **Cursor Down (CUD).** Moves the active position down Pn lines, where Pn is a selective numeric parameter. The cursor stops at the bottom margin.

Cursor Down	9/11		4/2
(CUD)	CSI	Pn	B

■ **Cursor Position (CUP).** Positions the cursor at line P1, column Pc.

Cursor Position	9/11		3/11		4/8
(CUP)	CSI	P1	;	Pc	H

■ **Cursor Next Line (CNL).** Positions the cursor at the next line.

	CS1	Pn	E

■ **Cursor Previous Line (CPL).** Positions the cursor at the previous line.

	CS1	Pn	F

■ **Horizontal and Vertical Position (HVP).** Performs the same function as CUP, positioning the cursor at P1, column Pc. Whenever possible, use CUP instead of HVP.

9/11		3/11		6/6
CSI	P1	;	Pc	f

■ **Horizontal Position Absolute (HPA).** Positions the cursor at the absolute column address.

	CS1	Pn	E

■ **Index (IND).** Positions the cursor down one line within the same column. If the cursor position is the bottom margin, the screen scrolls up.

Index	1/11	4/4
(IND)	ESC	D

■ **Reverse Index (RI).** Positions the cursor up one line within the same column. If the cursor position is the top margin, the screen scrolls down.

Reverse index	1/11	4/13
(RI)	ESC	M

■ **Next Line (NEL).** Positions the cursor at the first position on the next line. If the cursor position is the bottom margin, the screen scrolls up.

Next Line	1/11	4/5
(NL)	ESC	E

■ **Save Cursor (SC).** Saves the following states in the terminal memory: cursor position, graphic rendition, character set shift state, state of wrap flag, state of origin mode, and state of selective erase.

Save Cursor	1/11	3/7
(SC)	ESC	7

■ **Restore Cursor (RC).** Restores the states listed in the save cursor command. If these states were not saved, then the cursor moves to the home position, the origin mode is reset, character attributes are not assigned, and default character set mapping is established.

Restore Cursor	1/11	3/8
(RC)	ESC	8

Controlling Character Attributes

7.6.8 Character attributes display features that affect the character display without changing the character itself. Character attributes allow you to designate erasable and non-erasable characters. Graphic renditions affect the appearance of the cursor on the page. These features are described in the following paragraphs.

Select Character Attributes (SCA)

7.6.8.1 Use the following format to select the erasable and non-erasable characters:

9/11		2/2	7/1
CSI	Ps	"	q

Select one of the following values for Ps:

Ps	Action
0	Attributes off
1	Designates character as non-erasable using SEL/SED
2	Designates character as erasable using SEL/SED

NOTE: A 0 parameter value, attribute off, is the default. A 2 parameter value is a request for the attribute to be off.

Select Graphic Rendition (SGR)

7.6.8.2 Use the following format to select character renditions:

9/11		3/11			6/13
CSI	Ps	;	Ps	...	m

Multiple parameters are performed in sequence with cumulative effects. The following example shows how to change from increased intensity to blinking-underlined:

9/11	3/0	3/11	3/4	3/11	3/5	6/13
CSI	0	;	4	;	5	m

No delimiter (3/11) is used when a single parameter is selected. The following example shows how to select the blinking-only parameter:

9/11	3/5	6/13
CSI	5	m

When you select an attribute, the new characters received appear with that attribute. If the characters are moved, the attributes move with the characters.

Select character attributes using these formats and the following Ps parameter values:

Ps		Action
3/0 0		Attributes off
3/1 1		Display bold
3/4 4		Display underscored
3/5 5		Display blinking
3/7 7		Display negative (reverse) image
3/2 2	3/2 2	Display normal intensity
3/2 2	3/4 4	Display not underlined
3/2 2	3/5 5	Display not blinking
3/2 2	3/7 7	Display positive image

Controlling Line Attributes

7.6.9 Line attributes are display features that affect a display line. Use the cursor to select the line. When the attribute changes, the cursor remains in the same character position. It will not move beyond the right margin. If you scroll the lines on the screen, the attribute moves with the line.

NOTE: If you erase a line, the line attribute reverts to single height, single width.

■ **Single Width Row (SWR).** The single width row command creates a single width, single height row at the cursor position. A single width row is the default line attribute for all new lines.

1/11	2/3	3/5
ESC	#	5

■ **Double Width Row (DWR).** The double width row command creates a double width, single height row at the cursor position. A single width, single height row loses all characters to the right of center.

1/11	2/3	3/6
ESC	#	6

■ **Double Height Top Row (DHTR).** The double height top row command creates a row with the cursor at the top half of a double height, double width row. Use these sequences in pairs on adjacent rows. Use the same character on both lines to form a full character. A single width, single height row loses all characters to the right of center.

1/11	2/3	3/3
ESC	#	3

■ **Double Height Bottom Row (DHBR).** The double height bottom row command creates a row with the cursor at the bottom half of a double height, double width row. Use these sequences in pairs on adjacent rows. Use the same character on both lines to form a full character. A single width, single height row loses all characters to the right of center.

1/11	2/3	3/4
ESC	#	4

Erasing   **7.6.10** Erasing removes the characters designated for erasing without affecting the other characters on the screen. The erased characters are not stored, and so cannot be retrieved. The cursor position does not change when you erase characters or lines.

Erasing a character also erases any of the character's attributes.

■ **Erase Character (ECH).** Erases the character at the cursor position and the next n-1 characters. A parameter of either 0 or 1 erases a single character. No parameter specified is interpreted as a parameter of zero. Character attributes are set to normal. The data on the line is not reformatted, and the cursor remains in the same position.

Erase character	9/11		5/8
(ECH)	CSI	Pn	X

■ **Erase in Display (ED).** Erases from the cursor to the end of the screen, including the cursor position. The line attribute is set to single-height, single-width for all erased lines. Use either of the following:

Erase in display	9/11	4/10
(ED)	CSI	J

	9/11	3/0	4/10
	CSI	0	J

Use the following function to erase from the beginning of the screen to the cursor, including the cursor position. The line attribute is set to single-height, single-width for all erased lines.

9/11	3/1	4/10
CSI	1	J

Use the following function to erase the entire display. All lines are erased and the line attributes set to single-width. The cursor does not move.

```
9/11    3/2     4/10
CSI     2       J
```

■ **Selective Erase In Display (SED).** Erases all erasable characters (SCA) from the cursor to the end of the screen, including the cursor. Does not affect line attributes or character attributes (SGR). Use either of the following functions:

Selective erase   9/11   3/15   4/10
in display (SED)   CSI   ?   J

                          9/11   3/15   3/0   4/10
                          CSI   ?   0   J

Use the following function to erase all erasable characters (SCA) from the beginning of the screen to and including the cursor. Does not affect line attributes or character attributes (SGR).

```
9/11    3/15    3/1     4/10
CSI     ?       1       J
```

Use the following function to erase all erasable characters (SCA) in the entire display. Does not affect character attributes or line attributes (SGR).

```
9/1     3/15    3/2     4/10
CSI     ?       2       J
```

■ **Erase in Line (EL).** Erases the cursor and all other characters to the end of the line. The line attribute is not changed. Use either of the following:

Erase in line   9/11   4/11
(EL)   CSI   K

                          9/11   3/0   4/11
                          CSI   0   K

Use the following function to erase from the beginning of the line to the cursor position, including the cursor position. The line attribute is not changed.

```
9/11    3/1     4/11
CSI     1       K
```

Use the following function to erase the complete line.

```
9/11    3/2     4/11
CSI     2       K
```

■ **Selective Erase In Line (SEL).** Erases all erasable characters (SCA) from the cursor to the end of the line, including the cursor position. Does not affect line attributes or character attributes (SGR). Use either of the following:

Selective erase	9/11	3/15	4/11
in line (SEL)	CSI	?	K

	9/11	3/15	3/0	4/11
	CSI	?	0	K

Use the following function to erase all erasable characters (SCA) from the beginning of the line to the cursor position, including the cursor position. Does not affect line attributes or character attributes.

9/11	3/15	3/1	4/11
CSI	?	1	K

Use the following function to erase all erasable characters (SCA) on the line. Does not affect line attributes or character attributes.

9/11	3/15	3/2	4/11
CSI	?	2	K

Inserting and Deleting Characters

7.6.11 The following list describes the insert and delete character commands available with the 924 VDT.

■ **Insert Characters (ICH).** Enters *pn* blank characters at the cursor position, with the attributes set to normal. The cursor does not move, but remains at the beginning of the inserted characters.

A parameter of either 0 or 1 causes one blank character to be inserted. Data on the line is shifted forward as characters are inserted.

Insert characters	9/11		4/0
(ICH)	CSI	Pn	@

■ **Delete Character (DCH).** Deletes *pn* characters beginning with the character at the cursor position. All characters to the right of the deleted characters move to the left. The right margin is filled with a space character for each character deleted.

Character attributes move with their characters. The spaces filled at the end of the line have all of their character attributes off.

Delete character	9/11		5/0
(DCH)	CSI	Pn	P

Inserting and Deleting Lines 7.6.12 The following list describes the insert and delete line commands available with the 924 VDT.

■ **Insert Line (IL).** Inserts *pn* lines at the cursor. If there are less than *pn* lines from the cursor to the end of the scroll region, lines are only inserted to the end of the scroll region. Lines moved past the bottom margin are deleted. The cursor is reset to column one.

Insert line	9/11		4/12
(IL)	CSI	Pn	L

■ **Delete Line (DL).** Deletes *pn* lines starting at the cursor line. If there are fewer than *pn* lines from the current line to the end of the scroll region, lines are only deleted to the end of the scroll region. As lines are deleted, lines below the cursor move up, and blank lines are added at the bottom of the scroll region. The cursor is reset to column one.

Delete line	9/11		4/13
(DL)	CSI	Pn	M

Tab Functions 7.6.13 The following list describes the tab functions available with the 924 VDT.

■ **Horizontal Tab (HT).** When the terminal receives a horizontal tab code (HT, 0/9), the cursor advances (tabs) to the next tab stop. If there is no next tab, the cursor moves to the right margin. You can set and clear the tab stops using the following sequences.

Horizontal tab	0/9
(HT)	

■ **Horizontal Tab Set (HTS).** Sets a tab stop at the current column. HTS is an 8-bit control character (8/8) that you can also express as an escape sequence when coding for a 7-bit environment.

Horizontal	1/11	4/8
tab set (HTS)	ESC	H

■ **Cursor Backward Tab (CBT).** Moves the cursor to the next tab stop backward. If *Pn* is larger than the number of tab stops, the cursor stops at the left margin. (Default *Pn* = 1.)

Cursor backward	9/11		5/10
tab (CBT)	CSI	Pn	Z

■ **Cursor Horizontal Tabulation (CHT).** Moves the cursor to the next tab stop. If *Pn* is larger than the number of tab stops, the cursor stops at the right margin. (Default *Pn* = 1.)

Cursor horizontal	9/11		4/9
tab (CHT)	CSI	Pn	I

■ **Tab Clear (TBC).** Clears a horizontal tab stop at the cursor position. Use either of the following:

| Tabulation | 9/11 | 6/7 | |
| Clear (TBC) | CSI | g | |

| | 9/11 | 3/0 | 6/7 |
| | CSI | 0 | g |

Use the following function to clear *all* horizontal tab stops:

| 9/11 | 3/3 | 6/7 |
| CSI | 3 | g |

NOTE: These settings can be changed in set-up. See Section 5.

Printing   7.6.14 The following list describes the printing sequences for the 924 VDT. Before you select a print operation, check the printer status using the print status report (DSR).

■ **Print Screen.** Prints the screen display (full screen or scrolling region, depending on the Print Extent EXT selection). Printer form feed mode (PFF) selects either a form feed (FF) or nothing as the print terminator. Use either of the following:

| Print screen | 9/11 | 6/9 | |
| | CSI | i | |

| | 9/11 | 3/0 | 6/9 |
| | CSI | 0 | i |

■ **Transparent Print.** Turns on transparent print mode. The terminal transmits characters received from the host to the printer without displaying them on the screen. All characters and character sequences except NUL, XON, XOFF, CSI 5 i, and CSI 4 i are sent to the printer. When in transparent print mode, keyboard activity continues to be directed to the host.

| Transparent | 9/11 | 3/5 | 6/9 |
| print | CSI | 5 | i |

Use the following function to turn off transparent print mode.

| Disable transparent | 9/11 | 3/4 | 6/9 |
| print | CSI | 4 | i |

■ **Print Line.** Prints the display line that contains the cursor. The cursor position does not change.

| Print line | 9/11 | 3/15 | 3/1 | 6/9 |
| | CSI | ? | 1 | i |

■ **Auto Print Mode.** Enables auto print mode. Subsequent display lines print when you move the cursor off the line using a line feed, form feed, vertical tab, or auto wrap. The printed line is terminated with a carriage return.

Auto print mode	9/11	3/15	3/5	6/9
	CSI	?	5	i

Use the following function to turn off auto print mode.

Disable auto print mode	9/11	3/15	3/4	6/9
	CSI	?	4	i

Reading the Screen **7.6.15** The read screen functions are implemented as additional options to the media copy function. The following definitions have been established to comply with the ISO 6429.2 standards.

■ Primary auxiliary device — The device connected to the auxiliary port of the 924 VDT.

■ Secondary auxiliary device — The host computer that is connected to the host port of the 924 VDT.

The following paragraphs describe the read screen functions.

Read Entire Screen **7.6.15.1** The read entire screen function uses the "initiate screen media transfer to secondary auxiliary device" function of the ISO 6429.2 standard. The coding for this command is:

Read entire screen	9/11	3/2	6/9
	CSI	2	i

The response from the terminal to the host is bracketed by the following C1 control characters.

■ SOS — start of string. SOS is represented by >98 in 8-bit mode and by >1B >58 in 7-bit mode.

■ ST — string terminator. ST is represented by >9C in 8-bit mode and by >1B >5C in 7-bit mode.

Immediately following the SOS, the appropriate invocation sequence (lock shift) for the first character on the screen is transmitted. If character sets are changed in the data on the screen, the new invocation sequence is transmitted before the first character of the new character set.

Read Screen Row **7.6.15.2** The read row containing the cursor function uses the "initiate screen media transfer (row only) to secondary auxiliary device" function of the ISO 6429.2 standard. The coding for this command is:

Read screen row	9/11	3/15	3/3	6/9
	CSI	?	3	i

The response from the terminal to the host is bracketed by the following C1 control characters:

■ SOS — start of string. SOS is represented by >98 in 8-bit mode and by >1B >58 in 7-bit mode.

■ ST — string terminator. ST is represented by >9C in 8-bit mode and by >1B >5C in 7-bit mode.

Immediately following the SOS, the appropriate invocation sequence (lock shift) for the first character on the screen is transmitted. If character sets are changed in the data on the screen, the new invocation sequence is transmitted before the first character of the new character set.

Reset Commands

7.6.16 There are two terminal reset commands. One causes a reset to initial state (RIS), and the other causes a soft terminal reset (STR). The terminal reset commands are described in the following paragraphs.

Hard Terminal Reset (RIS)

7.6.16.1 RIS (hard terminal reset or reset-to-initial state) can be invoked at any time by using the Recall function in set-up. It can also be invoked from the host computer at any time with an escape sequence. RIS causes an NVR recall. The coding for this command is:

Hard terminal	1/11	6/3
reset (RIS)	ESC	c

All Set-Up parameters are replaced by their NVR values, or power-up default values if there are no NVR values stored. In addition, RIS:

■ Clears the screen

■ Clears a down-line loaded character set

■ Clears UDKs

■ Returns the cursor to the upper-left corner of the screen

■ Sets all character sets to the default

■ Sets the SGR state to normal

■ Sets the selective erase attribute write state to nonselective erasable

■ Performs a communications line disconnect

Soft Terminal Reset (STR)

7.6.16.2 STR can be invoked at any time by using the Reset Terminal function in set-up. It can be invoked directly from the host computer with the STR sequence, or indirectly with the SCL sequence. The coding for this command is:

Soft terminal	9/11	2/1	7/0
reset	CSI	!	p

Table 7-20 lists the initial states of the TI 924 VDT after a soft terminal reset.

Table 7-20

Soft Terminal Reset (STR) States

Sequence	States	Stored in NVR
Text cursor ignored	On	Yes, NVR value
Insert/replace	Replace	No
Origin mode	Absolute	No
Autowrap	Off	Yes, NVR value ignored
Keyboard action	Unlocked	No
Keyboard mode	Numeric	No
Cursor key mode	Normal	No
Top margin	1	No
Bottom margin	24	No
Character sets	See note	No

Note:

Model 924 VDT default when in TI 924 mode or via set-up only

Advanced Topics

7.6.17 The following paragraphs explain the advanced features available with the 924 VDT.

Set Top and Bottom Margins (STBM)

7.6.17.1 The scrolling region is the area of the screen that can insert new characters by scrolling old characters off the screen. The minimum size of the scrolling region allowed is two lines.

This sequence selects top (Pt) line number and bottom (Pb) line number margins defining the scrolling region. These default to top and bottom respectively, so power-up or reset causes the scrolling region to be the entire screen.

Set top and bottom	9/11		3/11		7/2	
margins (STBM)	CSI	Pt	;	Pb	r	

User-Definable Key Control String (UDK)

7.6.17.2 Certain key sequences on the terminal can be programmed to transmit user-defined character strings. The host computer can load these definitions into the terminal to give the operator access to common host functions by using fewer key strokes. Another use of user-defined keys (UDKs) is to provide for a limited remapping capability for tailoring a keyboard to the preferences of a particular user.

The key sequences that can be user-defined on the 924 VDT are shown in Table 7-21. Each user-defined key has a default value that is transmitted by that key if it is not redefined. The UDK value is a numeric parameter used by the UDK command to identify the key being programmed by the command.

Table 7-21

User-Defined Key Numbers and Default Codes

Terminal Key Sequence	UDK Value	Default Code Sent			
(SHIFT) F1	17	9/11	3/2	3/5	7/14
(SHIFT) F2	18	9/11	3/2	3/6	7/14
(SHIFT) F3	19	9/11	3/4	3/0	7/14
(SHIFT) F4	20	9/11	3/4	3/1	7/14

Table 7-21	**User-Defined Key Numbers and Default Codes (Continued)**		
Terminal Key Sequence	**UDK Value**	**Default Code Sent**	
(SHIFT) F5	21	9/11 3/4 3/2 7/14	
(SHIFT) F6	23	9/11 3/4 3/3 7/14	
(SHIFT) F7	24	9/11 3/4 3/4 7/14	
(SHIFT) F8	25	9/11 3/4 3/5 7/14	
(SHIFT) F9	26	9/11 3/4 3/6 7/14	
(SHIFT) F10	28	9/11 3/4 3/7 7/14	
(SHIFT) F11	29	9/11 3/4 3/8 7/14	
(SHIFT) F12	31	9/11 3/4 3/9 7/14	
ATTN	32	9/11 3/2 3/8 7/14	
ENTER	33	9/11 3/1 7/14	
SEND	34	9/11 3/4 7/14	

NOTE: You can only download user-defined key sequences while in 924 mode. This feature is not accessible in either VT100 or 931 modes.

A total of 256 bytes of storage is available to hold definitions for the 15 user-defined key sequences. A maximum of 255 bytes can be allocated to any single UDK. The available bytes are allocated on a first-come, first-served basis. Once the UDK space has been depleted, no additional UDKs are stored until space is released. There are three ways that UDK definition space can be released under control of the host computer.

■ A user-defined key with an existing UDK value can be redefined using the UDK command. In this case, the space assigned to the current definition is released, and new space is allocated to hold the new definition.

■ One or more user-defined keys can be cleared by using the UDK command with the clear parameter described below.

■ You can cause the 924 VDT to reset its UDK space by sending the Reset to Initial State (RIS) command. This command has many other side effects and should be used only in severe circumstances.

You can also clear UDK space with the set-up screen functions to reset the terminal, or by cycling power on the terminal.

The UDK sequence is formatted as a device control string. The device control string has the following format when used to define UDKs.

9/0	Ps	3/11	Ps	7/12	Ps	3/11	...	3/11	Ps	9/12
DCS	Pc	;	Pl	|	ky1/st1	;	...	;	kyN/stN	ST

The device control string introducer (DCS) is a C1 control character with value 9/0 (1/11 5/0 in 7-bit mode).

The clear parameter (denoted by Pc in the UDK string) is a selective parameter which specifies if the user wants to clear existing UDK values. The following values for Pc are defined:

- Pc = 0 or Pc not present: Clear all UDKs before loading new values.

- Pc = 1: Clear only keys for which new values are specified in this device control string.

The *lock parameter* (denoted by Pl in the UDK string) is a selective parameter used to specify whether the user wants to lock UDK values after loading them.

The vertical bar character (7/12 in the UDK string) identifies the device control string as a UDK load sequence. This vertical bar is a *final character* in a control sequence.

The *key definition strings* (denoted by kyN/stN in the UDK string) are the portions of the UDK sequence which specify uniquely the key to be defined, and the value to be loaded into memory for each key. The *key specifier* portion of the definition identifies the key to be defined. The *string parameter* defines the character sequence to be transmitted by the key. The key specifier and the string parameter are separated by an ASCII / (2/15).

Multiple key definition strings can be included in a single UDK command. When multiple keys are defined, the definition strings are separated by an ASCII ; (3/11).

The UDK command is terminated by the C1 control character ST (string terminator). ST is encoded in an 8-bit environment as 9/12 and in a 7-bit environment as ESC \ (1/11 5/12).

Terminal Status Commands

7.6.18 Device attribute and device status reports are sent on request from the terminal to the host computer. These reports provide information concerning terminal identification, cursor position, and terminal operating status.

Primary Device Attributes (DA)

7.6.18.1 During a primary device attribute exchange, the host computer requests the terminal's service class code and basic attributes. The terminal response depends on the value in the Terminal ID field.

The following is an example of a primary device attribute exchange:

Communication	Sequence	Meaning
Host to 924	CSI c or CSO 0 c	Asks for service code and attributes
924 to host	CSI ? 62; 1; 2; 6; 7; 8; 9 c	A class 2 terminal with 132 columns, printer port, selective erase, DRCS, UDK; supports 7-bit national replacement character sets

Secondary Device
Attributes (DA)

7.6.18.2 During a secondary device attribute exchange, the host computer requests the terminal's identification code, firmware version level, and an account of the hardware options.

The following is an example of a secondary device attribute exchange:

Communication	Sequence	Meaning
Host to 924	CSI > c or CSI > 0 c	Type of terminal, firmware version
924 to host	CSI > 1; Pv; Po c	A TI 924 firmware version

Device Status
Reports (DSR)

7.6.19 During a device status report, a request for the general operating status of the terminal and/or printer is sent from the host computer. If the terminal is in printer controller mode, the message is received but not answered.

Report Cursor
Position

7.6.19.1 The following is an example of a report on cursor position, with DSR set to TI924.

Communication	Sequence	Meaning
Host to 924	CSI 5 n	Report operating status using a DSR control sequence
924 to host	CSI 0 n	No malfunction
924 to host	CSI 3 n	Malfunction
Host to 924	CSI 6 n	Report cursor position using CPR control sequence
924 to host	CSI Pv; Ph R	States vertical and horizontal cursor position

Report Printer
Status

7.6.19.2 The following is an example of a report on a printer port, with DSR set to Printer Port.

NOTE: Printer status must be determined before entering any print mode or using any print functions.

Communication	Sequence	Meaning
Host to 924	CSI ? 15 n	Request for printer status
924	CSI ? 13 n	DTR not asserted on printer port since power-up or reset; no printer
	CSI ? 10 n	DTR asserted on printer port; printer ready
	CSI ? 11 n	DTR not asserted on printer port; printer not ready

---

Report UDK Status   **7.6.19.3** The following is an example of a report on user-defined keys, with DSR set to User-Defined Keys.

Communication	Sequence	Meaning
Host to 924	CSI ? 25 n	User-defined keys locked or unlocked
924 to host	CSI ? 20 n	User-defined keys unlocked
	CSI ? 21 n	User-defined keys locked

Device Identification   **7.6.20** This sequence causes the terminal to send a primary DA response sequence. Use the primary DA request for this purpose.

The following is the device identification sequence:

1/11	5/10
ESC	Z

Diagnostic Procedures, Self Test

7.7 The 924 VDT provides alignment patterns and tests you can perform from the keyboard or from the host computer.

Alignment Test (ALN)   **7.7.1** Use the screen alignment pattern to adjust the screen. You can display the screen alignment pattern with the following sequence:

1/11	2/3	3/8
ESC	#	8

Uppercase E's appear on the screen when performing this sequence.

Tests (TST)   **7.7.2** Ps is a parameter that indicates a test to perform. Several tests can be performed at once by separating each parameter with a semicolon. The tests are performed randomly. The following is the sequence format for using terminal tests:

9/11	3/4	3/11		3/11	3/11		7/9
CSI	4	;	Ps	; . . . ;	Ps		y

NOTE: Tests disconnect communication lines.

Below is a list of the parameters and associated tests.

Parameter	Test
0	Tests 1, 2, 3, and 6
1	Power up, self test
2	EIA port data loopback test
3	Printer port loopback test
4	Not used
5	Not used
6	EIA port modem control line loopback test
7	20 mA port loopback test
8	Not used
9	Repeat any selected test until power off or failure
10 and up	Not used

924 MODE TRANSMITTED CODES
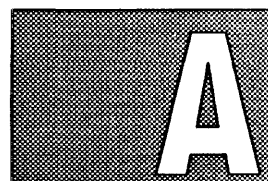
Introduction

This appendix includes three tables which show Model 924 VDT modes and the corresponding codes transmitted by the following:

- The U.S. keyboard

- A numeric keypad calculator (set)

- A numeric keypad calculator (reset)

Table A-1 U.S. Keyboard — Row 1

Legend	Mode	Transmitted Code	Comment
F1	NORMAL	>8F >50	
	CAPS LOCK	>8F >50	
	SHIFT	>9B >32 >35 >7E	UDK #1
F2	NORMAL	>8F >51	
	CAPS LOCK	>8F >51	
	SHIFT	>9B >32 >36 >7E	UDK #2
F3	NORMAL	>8F >52	
	CAPS LOCK	>8F >52	
	SHIFT	>9B >34 >30 >7E	UDK #3
F4	NORMAL	>8F >53	
	CAPS LOCK	>8F >53	
	SHIFT	>9B >34 >31 >7E	UDK #4
F5	NORMAL	>9B >31 >36 >7E	
	CAPS LOCK	>9B >31 >36 >7E	
	SHIFT	>9B >34 >32 >7E	UDK #5
F6	NORMAL	>9B >31 >37 >7E	
	CAPS LOCK	>9B >31 >37 >7E	
	SHIFT	>9B >34 >33 >7E	UDK #6
F7	NORMAL	>9B >31 >38 >7E	
	CAPS LOCK	>9B >31 >38 >7E	
	SHIFT	>9B >34 >34 >7E	UDK #7
F8	NORMAL	>9B >31 >39 >7E	
	CAPS LOCK	>9B >31 >39 >7E	
	SHIFT	>9B >34 >35 >7E	UDK #8
F9	NORMAL	>9B >32 >30 >7E	
	CAPS LOCK	>9B >32 >30 >7E	
	SHIFT	>9B >34 >36 >7E	UDK #9
F10	NORMAL	>9B >32 >31 >7E	
	CAPS LOCK	>9B >32 >31 >7E	
	SHIFT	>9B >34 >37 >7E	UDK #10

Legend	Mode	Transmitted Code	Comment
F11	NORMAL	>9B >32 >33 >7E	
	CAPS LOCK	>9B >32 >33 >7E	
	SHIFT	>9B >34 >38 >7E	UDK #11
F12	NORMAL	>9B >32 >34 >7E	
	CAPS LOCK	>9B >32 >34 >7E	
	SHIFT	>9B >34 >39 >7E	UDK #12
<=X	NORMAL	>7F	
	CAPS LOCK	>7F	
	SHIFT	>7F	
ESC	NORMAL	>1B	
	CAPS LOCK	>1B	
	SHIFT	>1B >33 >31 >7E	
CMD	NORMAL	>9B >32 >39 >7E	
	CAPS LOCK	>9B >32 >39 >7E	
	SHIFT	>9B >32 >39 >7E	
ATTN	NORMAL	>9B >32 >38 >7E	UDK #13
	CAPS LOCK	>9B >32 >38 >7E	UDK #13
	SHIFT	>9B >32 >38 >7E	UDK #13
	ALT	NONE	Local hold screen function
INS	NORMAL	>9B >40	
	CAPS LOCK	>9B >40	
	SHIFT	>9B >4C	
DEL	NORMAL	>9B >50	
	CAPS LOCK	>9B >50	
	SHIFT	>9B >4D	
ID/BREAK	NORMAL	variable	Transmit answerback
	CAPS LOCK	variable	Transmit answerback
	SHIFT	NONE	Transmit break function
	SHIFT CTRL	NONE	Initiate disconnect
PRINT	NORMAL	>9B >33 >34 >7E	
	CAPS LOCK	>9B >33 >34 >7E	
	SHIFT	NONE	Local copy function

Legend	Mode	Transmitted Code	Comment
' ~	NORMAL	>60	
	CAPS LOCK	>60	
	SHIFT	>7E	
1 !	NORMAL	>31	
	CAPS LOCK	>31	
	SHIFT	>21	
2 @	NORMAL	>32	
	CAPS LOCK	>32	
	SHIFT	>40	
	CTRL	>00	
	ALT CTRL	>80	
3 #	NORMAL	>33	
	CAPS LOCK	>33	
	SHIFT	>23	
	CTRL	>1B	
	ALT CTRL	>9B	
4 $	NORMAL	>34	
	CAPS LOCK	>34	
	SHIFT	>24	
	CTRL	>1C	
	ALT CTRL	>9C	
5 %	NORMAL	>35	
	CAPS LOCK	>35	
	SHIFT	>25	
	CTRL	>1D	
	ALT CTRL	>9D	
6 ^	NORMAL	>36	
	CAPS LOCK	>36	
	SHIFT	>5E	
	CTRL	>1E	
	ALT CTRL	>9E	
7 &	NORMAL	>37	
	CAPS LOCK	>37	
	SHIFT	>26	
	CTRL	>1F	
	ALT CTRL	>9F	
8 *	NORMAL	>38	
	CAPS LOCK	>38	
	SHIFT	>2A	
	CTRL	>7F	
9 (	NORMAL	>39	
	CAPS LOCK	>39	
	SHIFT	>28	
0)	NORMAL	>30	
	CAPS LOCK	>30	
	SHIFT	>29	

Table A-1 U.S. Keyboard — Row 2 (Continued)

Legend	Mode	Transmitted Code	Comment
– _	NORMAL CAPS LOCK SHIFT	>2D >2D >5F	
= +	NORMAL CAPS LOCK SHIFT	>3D >3D >2B	
\ |	NORMAL CAPS LOCK SHIFT	>5C >5C >7C	
BACKSPAC	NORMAL CAPS LOCK SHIFT ALT	>08 >08 >08 NONE	 Local set-up function
HOME	NORMAL CAPS LOCK SHIFT	>9B >48 >9B >48 >9B >48	
SEND	NORMAL NORMAL SHIFT	>9B >34 >7E >9B >34 >7E >9B >34 >7E	UDK #15 UDK #15 UDK #15
=	NORMAL CAPS LOCK SHIFT ALT	>3D >3D >3D >9B >33 >32 >7E	 Skip
+	NORMAL CAPS LOCK SHIFT ALT	>2B >2B >2B >9B >37 >7E	 Erase field
SPACE	NORMAL CAPS LOCK SHIFT ALT	>20 >20 >20 >D7	 8859/1 Multiply
TAB	NORMAL CAPS LOCK SHIFT ALT CTRL	>09 >09 >9B >5A >F7 >9B >49	 Back Tab 8859/1 Divide 8859/1 CHT

Table A-1 U.S. Keyboard — Row 3

Legend	Mode	Transmitted Code	Comment
TAB	NORMAL	>09	
	CAPS LOCK	>09	
	SHIFT	>9B >5A	
	CTRL	>9B >49	8859/1 CHT
Q	NORMAL	>71	
	CAPS LOCK	>51	
	SHIFT	>51	
	CTRL	>11	
	ALT CTRL	>91	
W	NORMAL	>77	
	CAPS LOCK	>57	
	SHIFT	>57	
	CTRL	>17	
	ALT CTRL	>97	
E	NORMAL	>65	
	CAPS LOCK	>45	
	SHIFT	>45	
	CTRL	>05	
	ALT CTRL	>85	
R	NORMAL	>72	
	CAPS LOCK	>52	
	SHIFT	>52	
	CTRL	>12	
	ALT CTRL	>92	
T	NORMAL	>74	
	CAPS LOCK	>54	
	SHIFT	>54	
	CTRL	>14	
	ALT CTRL	>94	
Y	NORMAL	>79	
	CAPS LOCK	>59	
	SHIFT	>59	
	CTRL	>19	
	ALT CTRL	>99	
U	NORMAL	>75	
	CAPS LOCK	>55	
	SHIFT	>55	
	CTRL	>15	
	ALT CTRL	>95	
I	NORMAL	>69	
	CAPS LOCK	>49	
	SHIFT	>49	
	CTRL	>09	
	ALT CTRL	>89	
O	NORMAL	>6F	
	CAPS LOCK	>4F	
	SHIFT	>4F	
	CTRL	>0F	
	ALT CTRL	>8F	

Table A-1 U.S. Keyboard — Row 3 (Continued)

Legend	Mode	Transmitted Code	Comment
P	NORMAL	>70	
	CAPS LOCK	>50	
	SHIFT	>50	
	CTRL	>10	
	ALT CTRL	>90	
[{	NORMAL	>5B	
	CAPS LOCK	>5B	
	SHIFT	>7B	
	CTRL	>1B	
	ALT CTRL	>9B	
] }	NORMAL	>5D	
	CAPS LOCK	>5D	
	SHIFT	>7D	
	CTRL	>1D	
	ALT CTRL	>9D	
RETURN	NORMAL	>0D	
	CAPS LOCK	>0D	
	SHIFT	>0D	
	ALT	>9B >31 >7E	Enter
7	NORMAL	>37	
	CAPS LOCK	>37	
	SHIFT	>37	
8	NORMAL	>38	
	CAPS LOCK	>38	
	SHIFT	>38	
9	NORMAL	>39	
	CAPS LOCK	>39	
	SHIFT	>39	
–	NORMAL	>2D	
	CAPS LOCK	>2D	
	SHIFT	>2D	

Legend	Mode	Transmitted Code	Comment
CTRL	NORMAL CAPS LOCK SHIFT ALT SHIFT ALT	None—Mode key None—Mode key None—Mode key None—Mode key None—Mode key	
CAPSLOCK	NORMAL SHIFT ALT CTRL SHIFT ALT SHIFT CTRL ALT CTRL SHIFT ALT CTRL	None—Mode key None—Mode key None—Mode key None—Mode key None—Mode key None—Mode key None—Mode key None—Mode key	
A	NORMAL CAPS LOCK SHIFT CTRL ALT CTRL	>61 >41 >41 >01 >81	
S	NORMAL CAPS LOCK SHIFT CTRL ALT CTRL	>73 >53 >53 >13 >93	
D	NORMAL CAPS LOCK SHIFT CTRL ALT CTRL	>64 >44 >44 >04 >84	
F	NORMAL CAPS LOCK SHIFT CTRL ALT CTRL	>66 >46 >46 >06 >86	
G	NORMAL CAPS LOCK SHIFT CTRL ALT CTRL	>67 >47 >47 >07 >87	
H	NORMAL CAPS LOCK SHIFT CTRL ALT CTRL	>68 >48 >48 >08 >88	
J	NORMAL CAPS LOCK SHIFT CTRL ALT CTRL	>6A >4A >4A >0A >8A	

Table A-1 U.S. Keyboard — Row 4 (Continued)

Legend	Mode	Transmitted Code	Comment
K	NORMAL CAPS LOCK SHIFT CTRL ALT CTRL	>6B >4B >4B >0B >8B	
L	NORMAL CAPS LOCK SHIFT CTRL ALT CTRL	>6C >4C >4C >0C >8C	
; :	NORMAL CAPS LOCK SHIFT	>3B >3B >3A	
' "	NORMAL CAPS LOCK SHIFT	>27 >27 >22	
up arrow	NORMAL CAPS LOCK SHIFT	>9B >41 >9B >41 >9B >41	
4	NORMAL CAPS LOCK SHIFT	>34 >34 >34	
5	NORMAL CAPS LOCK SHIFT	>35 >35 >35	
6	NORMAL CAPS LOCK SHIFT	>36 >36 >36	
,	NORMAL CAPS LOCK SHIFT	>2C >2C >2C	

Legend	Mode	Transmitted Code	Comment
ALT	NORMAL	None—Mode key	
	CAPS LOCK	None—Mode key	
	SHIFT	None—Mode key	
	CTRL	None—Mode key	
	SHIFT CTRL	None—Mode key	
SHIFT	NORMAL	None—Mode key	
	CAPS LOCK	None—Mode key	
	ALT	None—Mode key	
	CTRL	None—Mode key	
	ALT CTRL	None—Mode key	
Z	NORMAL	>7A	
	CAPS LOCK	>5A	
	SHIFT	>5A	
	CTRL	>1A	
	ALT CTRL	>9A	
X	NORMAL	>78	
	CAPS LOCK	>58	
	SHIFT	>58	
	CTRL	>18	
	ALT CTRL	>98	
C	NORMAL	>63	
	CAPS LOCK	>43	
	SHIFT	>43	
	CTRL	>03	
	ALT CTRL	>83	
V	NORMAL	>76	
	CAPS LOCK	>56	
	SHIFT	>56	
	CTRL	>16	
	ALT CTRL	>96	
B	NORMAL	>62	
	CAPS LOCK	>42	
	SHIFT	>42	
	CTRL	>02	
	ALT CTRL	>82	
N	NORMAL	>6E	
	CAPS LOCK	>4E	
	SHIFT	>4E	
	CTRL	>0E	
	ALT CTRL	>8E	
M	NORMAL	>6D	
	CAPS LOCK	>4D	
	SHIFT	>4D	
	CTRL	>0D	
	ALT CTRL	>8D	
, <	NORMAL	>2C	
	CAPS LOCK	>2C	
	SHIFT	>3C	

Legend	Mode	Transmitted Code	Comment
. >	NORMAL	>2E	
	CAPS LOCK	>2E	
	SHIFT	>3E	
/ ?	NORMAL	>2F	
	CAPS LOCK	>2F	
	SHIFT	>3F	
SHIFT	NORMAL	None—Mode key	
	CAPS LOCK	None—Mode key	
	ALT	None—Mode key	
	CTRL	None—Mode key	
	ALT CTRL	None—Mode key	
<-	NORMAL	>9B >44	
	CAPS LOCK	>9B >44	
	SHIFT	>9B >44	
	ALT	>9B >35 >7E	Left field
down arrow	NORMAL	>9B >42	
	CAPS LOCK	>9B >42	
	SHIFT	>9B >42	
->	NORMAL	>9B >43	
	CAPS LOCK	>9B >43	
	SHIFT	>9B >43	
	ALT	>9B >36 >7E	Right field
1	NORMAL	>31	
	CAPS LOCK	>31	
	SHIFT	>31	
2	NORMAL	>32	
	CAPS LOCK	>32	
	SHIFT	>32	
3	NORMAL	>33	
	CAPS LOCK	>33	
	SHIFT	>33	
ENTER	NORMAL	>9B >31 >7E	UDK #14
	CAPS LOCK	>9B >31 >7E	UDK #14
	SHIFT	>9B >31 >7E	UDK #14

Table A-1 U.S. Keyboard — Row 6

Legend	Mode	Transmitted Code	Comment
COMPOSE	NORMAL	None—Mode key	
	CAPS LOCK	None—Mode key	
	SHIFT	None—Mode key	
	ALT	None—Mode key	
	CTRL	None—Mode key	
	SHIFT ALT	None—Mode key	
	SHIFT CTRL	None—Mode key	
	ALT CTRL	None—Mode key	
	SHIFT ALT CTRL	None—Mode key	
spacebar	NORMAL	>20	
	CAPS LOCK	>20	
	SHIFT	>20	
	ALT	>A0	8859/1 No break Space
	CTRL	>00	
accute	NORMAL	>B4	
	CAPS LOCK	>B4	
	SHIFT	>B4	
deg uml	NORMAL	>A8	
	CAPS LOCK	>A8	
	SHIFT	>B0	
0	NORMAL	>30	
	CAPS LOCK	>30	
	SHIFT	>30	
.	NORMAL	>2E	
	CAPS LOCK	>2E	
	SHIFT	>2E	

Table A-2 924 Mode — Numeric Keypad Calculator (Set Mode)

Legend	Mode	Transmitted Code	Comment
SPACE	NORMAL	>D7	8859/1 Multiply
	CAPS LOCK	>D7	
	SHIFT	>D7	
	ALT	>20	
TAB	NORMAL	>F7	8859/1 Divide
	CAPS LOCK	>F7	
	SHIFT	>9B >5A	Back tab
	ALT	>09	Tab
	CTRL	>9B >49	8859/1 CHT

Table A-3 924 Mode — Numeric Keypad Calculator (Reset Mode)

Legend	Mode	Transmitted Code	Comment
SPACE	NORMAL	>20	
	CAPS LOCK	>20	
	SHIFT	>20	
	ALT	>D7	8859/1 Multiply
TAB	NORMAL	>09	
	CAPS LOCK	>09	
	SHIFT	>9B >5A	Back tab
	ALT	>F7	8859/1 Divide
	CTRL	>9B >49	8859/1 CHT

924 MODE CODES AND FUNCTIONS
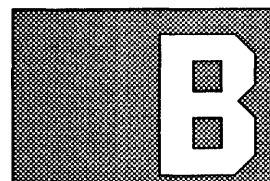
Introduction   This appendix includes information about the relationship between 924 VDT keys, control functions, and keyboard compatibilities.

Table B-1   8-Bit 8859/1 Graphics Symbols

8859/1 Code	8859/1 Character Description	Keyboard Compatibility/Font
A0	No break space	None: not defined
A1	Inverted exclamation mark	VT220 PC CHAR >AD
A2	Cent sign	VT220 PC CHAR >9B
A3	Pound sign (sterling)	VT220 PC CHAR >9C
A4	Currency sign	VT220 PC CHAR >A7
A5	Yen sign	VT220 PC CHAR >9D
A6	Broken bar	None: PC CHAR >7C
A7	Section sign	VT220 PC CHAR >15
A8	Diaresis	None: PC CHAR >FE
A9	Copyright sign	VT220 VT220 CHAR>A9
AA	Feminine ordinal sign	VT220 VT220 CHAR>AA
AB	Left angle mark	VT220 PC CHAR >AE
AC	Not sign	None: PC CHAR >AA
AD	Soft hyphen	None: not defined
AE	Registered trademark	None: not defined
AF	Macron	None: not defined
B0	Degree sign	VT220 PC CHAR >F8
B1	Plus/minus sign	VT220 PC CHAR >F1
B2	Superscript 2	VT220 PC CHAR >FD
B3	Superscript 3	VT220 VT220 CHAR>B3
B4	Acute accent	None: not defined
B5	Micro sign	VT220 PC CHAR >E6
B6	Pilcrow sign	VT220 VT220 CHAR>B6
B7	Middle dot	VT220 PC CHAR >FA
B8	Cedilla	None: not defined
B9	Superscript 1	VT220 VT220 CHAR>B9
BA	Masculine ordinal indicator	VT220 VT220 CHAR>BA
BB	RIght angle quotation mark	VT220 PC CHAR >AF
BC	Fraction one quarter	VT220 PC CHAR >AC
BD	Fraction one half	VT220 PC CHAR >AB
BE	Fraction three quarter	None: not defined
BF	Inverted question mark	VT220 PC CHAR >A8
C0	A with grave accent	VT220 VT220 CHAR>C0
C1	A with acute accent	VT220 VT220 CHAR>C1
C2	A with circumflex	VT220 VT220 CHAR>C2
C3	A with tilde	VT220 VT220 CHAR>C3
C4	A with umlaut	VT220 PC CHAR >8E
C5	A with ring above	VT220 PC CHAR >8F
C6	A E ligature	VT220 PC CHAR >92

8859/1 Code	8859/1 Character Description	Keyboard Compatibility/Font
C7	C with cedilla	VT220 PC CHAR >80
C8	E with grave accent	VT220 VT220 CHAR>C8
C9	E with acute accent	VT220 PC CHAR >90
CA	E with circumflex	VT220 VT220 CHAR>CA
CB	E with umlaut	VT220 VT220 CHAR>CB
CC	I with grave accent	VT220 VT220 CHAR>CC
CD	I with acute accent	VT220 VT220 CHAR
CE	I with circumflex	VT220 VT220 CHAR>CE
CF	I with umlaut	VT220 VT220 CHAR>CF
D0	Capital islandic eth	None: not defined
D1	N with tilde	VT220 PC CHAR >A5
D2	O with grave accent	VT220 VT220 CHAR>D2
D3	O with acute accent	VT220 VT220 CHAR>D3
D4	O with circumflex	VT220 VT220 CHAR>D4
D5	O with tilde	VT220 VT220 CHAR>D5
D6	O with umlaut	VT220 PC CHAR >99
D7	Multiply operator	None: not defined
D8	O with oblique stroke	VT220 PC CHAR >A6
D9	U with grave accent	VT220 VT220 CHAR>D9
DA	U with acute accent	VT220 VT220 CHAR>DA
DB	U with circumflex	VT220 VT2
DC	U with umlaut	VT220 PC CHAR >9A
DD	Y with acute accent	None: not defined
DE	Capital islandic thorn	None: not defined
DF	Small german letter sharp s	VT220 PC CHAR >E1
E0	a with grave accent	VT220 PC CHAR >85
E1	a with acute accent	VT220 PC CHAR >A0
E2	a with circumflex	VT220 PC CHAR >83
E3	a with tilde	VT220 VT220 CHAR>E3
E4	a with umlaut	VT220 PC CHAR >84
E5	a with ring above	VT220 PC CHAR >86
E6	Small a e ligature	VT220 PC CHAR >91
E7	c with cedilla	VT220 PC CHAR >87
E8	e with grave accent	VT220 PC CHAR >8A
E9	e with acute accent	VT220 PC CHAR >82
EA	e with circumflex	VT220 PC CHAR >88
EB	e with umlaut	VT220 PC CHAR >89
EC	i with grave accent	VT220 PC CHAR >8D
ED	i with acute accent	VT220 PC CHAR >A1
EE	i with circumflex	VT220 PC CHAR >8C
EF	i with umlaut	VT220 PC CHAR >8B
F0	Small islandic eth	None: not defined
FF	n with tilde	VT220 PC CHAR >A4
F2	o with grave accent	VT220 PC CHAR >95
F3	o with acute accent	VT220 PC CHAR >92
F4	o with circumflex	VT220 PC CHAR >93
F5	o with tilde	VT220 VT220 CHAR >F5
F6	o with umlaut	VT220 PC CHAR >94

Table B-1 8-Bit 8859/1 Graphics Symbols (Continued)

8859/1 Code	8859/1 Character Description	Keyboard Compatibility/Font
F7	Divide operator	VT220 PC CHAR >F6
F8	o with oblique stroke	VT220 PC CHAR >ED
F9	u with grave accent	VT220 PC CHAR >97
FA	u with acute accent	VT220 PC CHAR >A3
FB	u with circumflex	VT220 PC CHAR >96
FC	u with umlaut	VT220 PC CHAR >81
FD	y with acute accent	None: not defined
FE	Small islandic thorn	None: not defined
FF	y with umlaut	VT220 PC CHAR >98

Table B-2 ASCII Characters

ASCII Symbol	924 Key	Compatibilities		
space	space bar	931	VT220	VT100
!	(SHIFT) 1 !	931	VT220	VT100
"	(SHIFT) ' "	931	VT220	VT100
#	(SHIFT) 3 #	931	VT220	VT100
$	(SHIFT) 4 $	931	VT220	VT100
%	(SHIFT) 5 %	931	VT220	VT100
&	(SHIFT) 7 &	931	VT220	VT100
'	' "	931	VT220	VT100
(	(SHIFT) 9 (	931	VT220	VT100
)	(SHIFT) 0)	931	VT220	VT100
*	(SHIFT) 8 *	931	VT220	VT100
+	(SHIFT) = +	931	VT220	VT100
,	, <	931	VT220	VT100
-	- _	931	VT220	VT100
.	. >	931	VT220	VT100
/	/ ?	931	VT220	VT100
0 ... 9	0 ... 9	931	VT220	VT100
:	(SHIFT) ; :	931	VT220	VT100
;	; :	931	VT220	VT100
<	(SHIFT) , <	931		VT100
=	= +	931	VT220	VT100
>	(SHIFT) . >	931		VT100
?	(SHIFT) / ?	931	VT220	VT100
@	(SHIFT) 2 @	931	VT220	VT100
A ... Z	A ... Z	931	VT220	VT100
[	[{	931	VT220	VT100
\	\ |	931	VT220	VT100
]	] }	931	VT220	VT100
^	(SHIFT) 6 ^	931	VT220	VT100
_ (Underscore)	(SHIFT) - _	931	VT220	VT100
`	` ~	931	VT220	VT100
a ... z	a .. z	931	VT220	VT100
{	(SHIFT) [{	931	VT220	VT100
Vertical Bar	(SHIFT) \ |		VT220	VT100
}	(SHIFT)] }	931	VT220	VT100
~	(SHIFT) ` ~	931	VT220	VT100

Table B-3 7-Bit Control Functions

Control Function	924 Key	Compatibilities		
NULL	(CTRL) 2 or	931	VT220	
	(CTRL) space bar		VT220	VT100
SOH	(CTRL) A	931	VT220	VT100
STX	(CTRL) B	931	VT220	VT100
ETX	(CTRL) C	931	VT220	VT100
EOT	(CTRL) D	931	VT220	VT100
ENQ	(CTRL) E	931	VT220	VT100
ACK	(CTRL) F	931	VT220	VT100
BELL	(CTRL) G	931	VT220	VT100
BS	(CTRL) H or	931	VT220	VT100
	BACKSPACE	931	VT220	VT100
HT	(CTRL) I or	931	VT220	VT100
	TAB	931	VT220	VT100
LF	(CTRL) J	931	VT220	VT100
VT	(CTRL) K	931	VT220	VT100
FF	(CTRL) L	931	VT220	VT100
CR	(CTRL) M or	931	VT220	VT100
	RETURN	931	VT220	VT100
SO	(CTRL) N	931	VT220	VT100
SI	(CTRL) O	931	VT220	VT100
DLE	(CTRL) P	931	VT220	VT100
DC1	(CTRL) Q	931	VT220	VT100
DC2	(CTRL) R	931	VT220	VT100
DC3	(CTRL) S	931	VT220	VT100
DC4	(CTRL) T	931	VT220	VT100
NAK	(CTRL) U	931	VT220	VT100
SYN	(CTRL) V	931	VT220	VT100
ETB	(CTRL) W	931	VT220	VT100
CAN	(CTRL) X	931	VT220	VT100
EM	(CTRL) Y	931	VT220	VT100
SUB	(CTRL) Z	931	VT220	VT100
ESC	(CTRL) [or	931	VT220	VT100
	(CTRL) 3 or		VT220	
	ESC	931		VT100
FS	(CTRL) \ or	931	VT220	VT100
	(CTRL) 4		VT220	
GS	(CTRL)] or	931	VT220	VT100
	(CTRL) 5		VT220	
RS	(CTRL) ~ or	931	VT220	VT100
	(CTRL) 6	931	VT220	
US	(CTRL) ? or		VT220	VT100
	(CTRL) 7		VT220	
DEL	(CTRL) 8 or		VT220	VT100
	<-X		VT220	VT100

Table B-4 8-Bit Control Functions

Control Function		924 Key	Compatibilities
8/0		(ALT–CTRL) 2	Unique
8/1		(ALT–CTRL) A	Unique
8/2		(ALT–CTRL) B	Unique
8/3		(ALT–CTRL) C	Unique
IND	8/4	(ALT–CTRL) D	Unique
NEL	8/5	(ALT–CTRL) E	Unique
SSA	8/6	(ALT–CTRL) F	Unique
ESA	8/7	(ALT–CTRL) G	Unique
HTS	8/8	(ALT–CTRL) H	Unique
HTJ	8/9	(ALT–CTRL) I	Unique
VTS	8/10	(ALT–CTRL) J	Unique
PLD	8/11	(ALT–CTRL) K	Unique
PLU	8/12	(ALT–CTRL) L	Unique
RI	8/13	(ALT–CTRL) M	Unique
SS2	8/14	(ALT–CTRL) N	Unique
SS3	8/15	(ALT–CTRL) O	Unique
DCS	9/0	(ALT–CTRL) P	Unique
PU1	9/1	(ALT–CTRL) Q	Unique
PU2	9/2	(ALT–CTRL) R	Unique
STS	9/3	(ALT–CTRL) S	Unique
CCH	9/4	(ALT–CTRL) T	Unique
MW	9/5	(ALT–CTRL) U	Unique
SPA	9/6	(ALT–CTRL) V	Unique
EPA	9/7	(ALT–CTRL) W	Unique
9/8		(ALT–CTRL) X	Unique
9/9		(ALT–CTRL) Y	Unique
9/10		(ALT–CTRL) Z	Unique
CSI	9/11	(ALT–CTRL) [or	Unique
		(ALT–CTRL) 3	Unique
ST	9/12	(ALT–CTRL) \ or	Unique
		(ALT–CTRL) 4	Unique
OSC	9/13	(ALT–CTRL)] or	Unique
		(ALT–CTRL) 5	Unique
PM	9/14	(ALT–CTRL) ~ or	Unique
		(ALT–CTRL) 6	Unique
APC	9/15	(ALT–CTRL) ? or	Unique
		(ALT–CTRL) 7	Unique

Table B-5 Local Key Functions

Key Function Name	924 Key	Compatibilities
Hold screen	(ALT) ATTN	Same as VT220 F1
Print screen	(SHIFT) PRINT	Same as VT220 F2
Setup	(ALT–SHIFT) BACKSPACE	Same as VT220 F3
Here-is (ID)	ID/BREAK	Same as VT220 (CTRL) F5
Break	(SHIFT) ID/BREAK	Same as VT220 F5
Disconnect	(SHIFT–CTRL) BREAK	Same as VT220 (SHIFT) F5

RECEIVE CODES
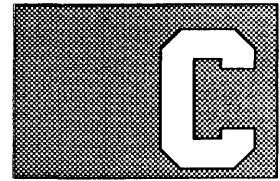
Introduction

This appendix contains information on control codes and sequences recognized by 924, 931, and VT100 modes.

Table C-1 C1 Control Codes Recognized, VT100 Mode

Control Function Name	ISO/DEC Mnemonic	Received Code	Comments
Index	IND	1/11 4/4	
Next line	NEL	1/11 4/5	
Horizontal tab set	HTS	1/11 4/8	
Reverse index	RI	1/11 4/13	
Control sequence introducer	CSI	1/11 5/11	

Table C-2 ISO/ANSI Sequences Recognized, VT100 Mode

Control Function Name	ISO/DEC Mnemonic	Received Code	Comments
Cursor left	CUB	CSI Pn D	
Cursor down	CUD	CSI Pn B	
Cursor right	CUF	CSI Pn C	
Cursor up	CUU	CSI Pn A	
Cursor position	CUP	CSI Pl;Pc H	
Device attributes	DA	CSI c or CSI 0 c	
Device status rpt	DSR	CSI Pn n CSI 0 n CSI 3 n CSI 5 n CSI 6 n	Ready, no malfunction Error Report status Report cursor position
Erase in display	ED	CSI Pn J CSI 0 J CSI 1 J CSI 2 J	
Erase line	EL	CSI Pn K CSI 0 K CSI 1 K CSI 2 K	
Horizontal and vertical position	HVP	CSI Pl;Pc f	

Table C-2 ISO/ANSI Sequences Recognized, VT100 Mode (Continued)

Control Function Name	ISO/DEC Mnemonic		Received Code	Comments
Load LED	LL	DEC	CSI Ps;Ps;Ps q	Load LEDs
Media copy	MC		CSI Pn i	
			CSI 0 i	Print screen
			CSI 4 i	End transparent print
			CSI 5 i	Begn transparent print
		DEC	CSI ? 1 i	Print line
		DEC	CSI ? 4 i	End auto print mode
		DEC	CSI ? 5 i	Begin auto print mode
Reset mode	RM		CSI Ps;Ps;Ps l	See mode table F-3
Select graphic rendition	SGR		CSI Pn m	
			CSI 0 m	All attributes off
			CSI 1 m	Bold
			CSI 4 m	Underscored
			CSI 5 m	Blinking
			CSI 7 m	Reverse image
Set top, bottom margins	STBM	DEC	CSI Pt;Pb r	
Set mode	RM		CSI Ps;Ps;Ps h	See mode table F-3
Tab clear	TBC		CSI Ps g	
			CSI 0 g	Active position clear
			CSI 3 g	All tabs cleared
Tests	TST	DEC	CSI 2 ; 0 y	
		DEC	CSI 2 ; 1 y	
		DEC	CSI 2 ; 2 y	
		DEC	CSI 2 ; 9 y	
		DEC	CSI 2 ; 10 y	
Alignment test	ALN	DEC	1/11 2/3 3/8	
Designate into G0 (94 characters)			1/11 2/8 Ps	
Designate into G1 (94 characters)			1/11 2/9 Ps	
Double height top row	DHTR	DEC	1/11 2/3 3/3	
Double height bottom row	DHBR	DEC	1/11 2/3 3/4	
Double width row	DWR	DEC	1/11 2/3 3/6	
ENQ ID	ENQID	DEC	1/11 5/A	
Keypad app.	KPAM	DEC	1/11 3/13	
Keypad numeric	KPNM	DEC	1/11 3/14	
Reset to initial state	RIS		1/11 6/3	
Restore cursor	RC	DEC	1/11 3/8	
Save cursor	SC	DEC	1/11 3/7	
Single width row	SWR	DEC	1/11 2/3 3/5	

Table C-3 ISO/ANSI Modes Supported by Set/Reset Mode, VT100

Name	ISO/DEC Mnemonic		Mode Parameter	Comments
Keyboard action	KAM		3/2	
Insertion replacement mode	IRM		3/4	
Send/receive mode	SRM		3/1 3/2	
Line feed/newline	LNM		3/2 2/0	
Cursor key mode	CKM	DEC	3/15 3/1	Implemented in this mode
ANSI/VT52	ANM	DEC	3/15 3/2	Always ANSI in 924
Column select	COLM	DEC	3/15 3/3	
Scroll select	SCLM	DEC	3/15 3/4	
Screen mode	SCNM	DEC	3/15 3/5	
Origin	OM	DEC	3/15 3/6	
Auto wrap	AWM	DEC	3/15 3/7	
Auto repeat	ARM	DEC	3/15 3/8	
Printer form feed	PFF	DEC	3/15 3/1 3/8	
Printer extent	PEX	DEC	3/15 3/1 3/9	
Printer form feed	PFF	DEC	3/15 3/1 3/8	
Cursor display	TCEM	DEC	3/15 3/2 3/5	

Table C-4 C1 Control Codes Recognized, 924 Mode

Control Function Name	ISO/DEC Mnemonic	Received Code	Comments
Index	IND	8/4 or 1/11 4/4	
Next line	NEL	8/5 or 1/11 4/5	
Horizontal tab set	HTS	8/8 or 1/11 4/8	
Reverse index	RI	8/13 or 1/11 4/13	
Single shift 2	SS2	8/14 or 1/11 4/14	
Single shift 3	SS3	8/15 or 1/11 4/15	
Device control string	DCS	9/0 or 1/11 5/0	
Control sequence introducer	CSI	9/11 or 1/11 5/11	
String terminator	ST	9/12 or 1/11 5/12	

Table C-5 ISO/ANSI Sequences Recognized, 924 Mode

Control Function Name	ISO/DEC Mnemonic		Received Code	Comments
Cursor backward tabulation	CBT		CSI Pn Z	
Cursor horizontal absolute	CHA		CSI Pn G	
Cursor horizontal tabulation	CHT		CSI Pn I	
Cursor next line	CNL		CSI Pn E	
Cursor preceding line	CPL		CSI Pn F	
Cursor left	CUB		CSI Pn D	
Cursor down	CUD		CSI Pn B	
Cursor right	CUF		CSI Pn C	
Cursor position	CUP		CSI Pl;Pc H	
Cursor up	CUU		CSI Pn A	
Device attributes	DA		CSI c or CSI 0 c	
Delete character	DCH		CSI Pn P	
Delete line	DL		CSI Pn M	
Device status rpt	DSR		CSI Pn n	
			CSI 0 n	Ready, no malfunction
			CSI 3 n	Error
			CSI 5 n	Report status
			CSI 6 n	Report cursor position
		DEC	CSI ? 1 0 n	Ready
		DEC	CSI ? 1 1 n	Not ready
		DEC	CSI ? 1 3 n	No print connection
		DEC	CSI ? 1 5 n	Report printer status
		DEC	CSI ? 2 0 n	UDKs are unlocked
		DEC	CSI ? 2 1 n	UDKs are locked
		DEC	CSI ? 2 5 n	Report UDK status
Erase character	ECH		CSI Pn X	
Erase in display	ED		CSI Pn J	
			CSI 0 J	
			CSI 1 J	
			CSI 2 J	
		DEC	CSI ? 0 J	Selective erase
		DEC	CSI ? 1 J	Selective erase
		DEC	CSI ? 2 J	Selective erase
Erase line	EL		CSI Pn K	
			CSI 0 K	
			CSI 1 K	
			CSI 2 K	
		DEC	CSI ? 0 K	Selective erase
		DEC	CSI ? 1 K	Selective erase
		DEC	CSI ? 2 K	Selective erase
Horizontal position absolute	HPA		CSI Pn '	' IS 6/0
Horizontal and vertical position	HVP		CSI Pl;Pc f	
Insert character	ICH		CSI Pn @	

Table C-5 ISO/ANSI Sequences Recognized, 924 Mode (Continued)

Control Function Name	ISO/DEC Mnemonic		Received Code	Comments
Insert line	IL		CSI Pn L	
Media copy	MC		CSI Pn i	
			CSI 0 i	Print screen
			CSI 2 i	Read screen
			CSI 4 i	End transparent print
			CSI 5 i	Begin transparent print
		DEC	CSI ? 1 i	Print line
		TI	CSI ? 3 i	Read screen row
		DEC	CSI ? 4 i	End auto print mode
		DEC	CSI ? 5 i	Begin auto print mode
		TI	CSI ? 6 i	End external loopback
		TI	CSI ? 7 i	Begin external loopback
		TI	CSI ? 9 i	End X-PRNT with pacing
Page configuration	PC	SAMPO ?	CSI 1 ; Ps z	
			CSI 1 ; 0 z	
			CSI 1 ; 1 z	
			CSI 1 ; 2 z	
			CSI 1 ; 3 z	
Next page	NP		CSI Pn U	
Previous page	PP		CSI Pn V	
Reset mode	RM		CSI Ps;Ps;Ps l	See mode table F-3
Scroll down	SD		CSI Pn T	
Scroll up	SU		CSI Pn S	
Select character attributes	SCA	DEC	CSI Ps 2/2 q	
		DEC	CSI 0 2/2 q	
		DEC	CSI 1 2/2 q	
		DEC	CSI 2 2/2 q	
Select graphic rendition	SGR		CSI Pn m	
			CSI 0 m	All attributes off
			CSI 1 m	Bold
			CSI 4 m	Underscored
			CSI 5 m	Blinking
			CSI 7 m	Reverse image
			CSI 22 m	Normal intensity
			CSI 24 m	Not underlined
			CSI 25 m	Not blinking
			CSI 27 m	Positive image
Set top, bottom margins	STBM	DEC	CSI Pt;Pb r	
Soft terminal reset	STR	DEC	CSI 2/1 p	
Set mode	SM		CSI Ps;Ps;Ps h	See mode table F-3
Tab clear	TBC		CSI Ps g	
			CSI 0 g	Active position clear
			CSI 2 g	All line tabs cleared
			CSI 3 g	All tabs cleared

Table C-5 ISO/ANSI Sequences Recognized, 924 Mode (Continued)

Control Function Name	ISO/DEC Mnemonic		Received Code	Comments
Tests	TST	DEC	CSI 4 ; 0 y	
		DEC	CSI 4 ; 1 y	
		DEC	CSI 4 ; 2 y	
		DEC	CSI 4 ; 3 y	
		DEC	CSI 4 ; 6 y	
		DEC	CSI 4 ; 7 y	
		DEC	CSI 4 ; 9 y	
Alignment test	ALN	DEC	1/11 2/3 3/8	
Designate into G0 (94 characters)			1/11 2/8 Ps	
Designate into G1 (94 characters)			1/11 2/9 Ps	
Designate into G2 (94 characters)			1/11 2/10 Ps	
Designate into G3 (94 characters)			1/11 2/11 Ps	
Designate into G1 (96 characters)			1/11 2/13 Ps	
Designate into G2 (96 characters)			1/11 2/14 Ps	
Designate into G3 (96 characters)			1/11 2/15 Ps	
Double height top row	DHT	DEC	1/11 2/3 3/3	
Double height bottom row	DHBR	DEC	1/11 2/3 3/4	
Double width row	DWR	DEC	1/11 2/3 3/6	
Dynamic redefinable character set load	DLD	DEC	DCS Pfn;Pcn;Pe;Pcms;Pwt;Pt 7/11 Dscs Sxbp1;Sxbp2; . Sxbpn ST	
ENQ ID	ENQID	DEC	1/11 5/10	
Keypad appl.	KPAM	DEC	1/11 3/13	
Keypad numeric	KPNM	DEC	1/11 3/14	
Lock shift 1R	LS1R		1/11 7/14	
Lock shift 2R	LS2R		1/11 7/13	
Lock shift 3R	LS3R		1/11 7/12	
Lock shift 2	LS2		1/11 6/14	
Lock shift 3	LS3		1/11 6/15	
Reset to initial state	RIS		1/11 6/3	
Restore cursor	RC	DEC	1/11 3/8	
Save cursor	SC	DEC	1/11 3/7	
Select 7-bit C1 controls	S7C1T		1/11 2/0 4/7	
Select 8-bit C1 controls	S8C1T		1/11 2/0 4/8	
Single width row	SWR	DEC	1/11 2/3 3/5	
UDK control string	UDK	DEC	DCS Pc;Pl 7/12 KYN/STN; .... ST	

Table C-6 ISO/ANSI Modes Supported by Set/Reset Mode, 924 Mode

Name	ISO/DEC Mnemonic		Mode Parameter	Comments
Keyboard action	KAM		3/2	
Insertion replacement mode	IRM		3/4	
Send/receive mode	SRM		3/1 3/2	
Line feed/newline	LNM		3/2 2/0	
Cursor key mode	CKM	DEC	3/15 3/1	Always cursor in 924
ANSI/VT52	ANM	DEC	3/15 3/2	Always ANSI in 924
Column select	COLM	DEC	3/15 3/3	
Scroll select	SCLM	DEC	3/15 3/4	
Screen mode	SCNM	DEC	3/15 3/5	
Origin	OM	DEC	3/15 3/6	
Auto wrap	AWM	DEC	3/15 3/7	
Auto repeat	ARM	DEC	3/15 3/8	
Printer form feed	PFF	DEC	3/15 3/1 3/8	
Printer extent	PEX	DEC	3/15 3/1 3/9	
Printer form feed	PFF	DEC	3/15 3/1 3/8	
Auto-page mode	APM	SAMPO	3/15 3/2 3/0	
Cursor display	TCEM	DEC	3/15 3/2 3/5	
Multipage mode	MPM	SAMPO	3/15 3/3 3/0	

Table C-7 C0 Control Codes Recognized, 931 Mode

Control Function Name	Received Code	Comments
Null	0/0	
Backspace	0/8	
Bell	0/7	
Carriage return	0/13	
Control sequence introducer	1/11	
Device control 1	1/1	
Device control 3	1/3	
Enquiry	0/5	
Line feed	0/10	
Select primary character set	0/15	
Select alternate character set	0/14	
Cursor down	1/11 4/2	
Cursor home	1/11 4/8	
Cursor off	1/11 5/2	
Cursor on	1/11 4/D	
Cursor left	1/11 4/4	
Cursor right	1/11 4/3	
Cursor up	1/11 4/1	
Set cursor address	1/11 5/9 Pr Pc	
Enable cursor blink	1/11 5/6 3/1	
Disable cursor blink	1/11 5/6 3/0	
Move box	1/11 7/8 Pnrows Pncols Pr Pc	
Scroll down	1/11 6/2	
Scroll up	1/11 6/1	
Insert line	1/11 4/14	
Delete line	1/11 4/15	
Select fill character and attribute	1/11 2/1 char attr	
Select character edit boundary	1/11 2/2 Pr Pc	
Select line edit extend boundary	1/11 2/3 Pr	
Enable character edit extent	1/11 2/4 3/1	
Disable character edit extent	1/11 2/4 3/0	
Erase all	1/11 4/12	
Erase to end of line	1/11 4/9	
Erase to end of screen	1/11 4/10	
Erase to address	1/11 3/14 Pr Pc	
Attribute AND	1/11 7/13 attr	

Table C-7 C0 Control Codes Recognized, 931 Mode (Continued)

Control Function Name	Received Code	Comments
Attribute OR	1/11 7/11 attr	
Repeat attribute to address	1/11 2/5 attr Pr Pc	
Repeat attribute Pn times	1/11 6/10 attr Pn	
Select and enter alternate SC1 character set	1/11 7/9 3/1	
Select and enter alternate SC2 character set	1/11 7/9 3/2	
Set display attribute	1/11 3/4 attr	
Video off	1/11 7/14	
Video on	1/11 7/12	
Cancel output	1/11 5/3	
Transparent print	1/11 4/6 1/11 2/8 print data 1/11 2/9	
Transparent print with buffer pacing	1/11 4/6 0/1 3/1 1/11 2/8 print data 1/11 2/9	
Read to address	1/11 4/0 Pr Pc	
Read cursor position	1/11 3/5	
Read status	1/11 3/6	
Control start	1/11 2/8	Used in transparent print
Control stop	1/11 2/9	Used in transparent print
Repeat to address	1/11 3/15 char Pr Pc	
Repeat character Pn times	1/11 6/11 char Pn	
Define answerback memory	1/11 4/7 4/10	
Define operational parameters	1/11 4/7 4/2	
Report terminal ID	1/11 4/7 4/9	
Keyboard lock	1/11 3/10	
Keyboard unlock	1/11 3/11	
External loopback test	1/111 4/7 4/5 1/11 2/8 loop data 1/11 2/9	

Table C-8 931 Codes Where Emulation is Not Required

Control Function Name	Received Code	Comments
Write to/select alternate status line	1/11 4/7 4/11	Supported in EM931
Restore primary status line	1/11 4/7 4/12	Supported in EM931
Write to message area	1/11 4/7 4/1	Supported in EM931
Erase message	1/11 3/12	Supported in EM931
Define comm parameters	1/11 4/7 4/13	
Define AUX1 parameters	1/11 4/7 4/14	
Enable/disable personality	1/11 7/7 3/0 1/11 7/7 3/1	
Reset NV memory	1/11 4/7 4/9 1/11 2/8 3/0 1/11 2/9	
Execute RAM test	1/11 4/7 4/9 1/11 2/8 3/1 1/11 2/9	
Verify all ROMs	1/11 4/7 4/9 1/11 2/8 3/2 1/11 2/9	
Barberpole all character sets	1/11 4/7 4/9 1/11 2/8 3/3 1/11 2/9	
Enter keyboard test mode	1/11 4/7 4/9 1/11 2/8 3/5 1/11 2/9	
Exit keyboard test mode	1/11 4/7 4/9 1/11 2/8 3/6 1/11 2/9	
Display screen adjust pattern	1/11 4/7 4/9 1/11 2/8 3/4 1/11 2/9	
Enter factory test mode		
Execute test		

931 MODE TRANSMITTED CODES
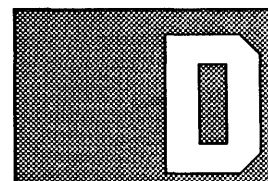
Introduction

This appendix shows transmitted codes for corresponding 931 mode keys. These tables list only keys that have codes which differ from the 924 mode keys.

Table D-1 931 Mode Transmitted Code Table

Key	Legend	Mode	Transmitted Code	Comment
1	F1	NORMAL	>1B 69 31	
1	F1	CAPS LOCK	>1B 69 31	
1	F1	SHIFT	>1B 69 3D	
2	F2	NORMAL	>1B 69 32	
2	F2	CAPS LOCK	>1B 69 32	
2	F2	SHIFT	>1B 69 3E	
3	F3	NORMAL	>1B 69 33	
3	F3	CAPS LOC	>1B 69 33	
3	F3	SHIFT	>1B 69 3F	
4	F4	NORMAL	>1B 69 34	
4	F4	CAPS LOCK	>1B 69 34	
4	F4	SHIFT	>1B 69 40	
5	F5	NORMAL	>1B 69 35	
5	F5	CAPS LOCK	>1B 69 35	
5	F5	SHIFT	>1B 69 41	
6	F6	NORMAL	>1B 69 36	
6	F6	CAPS LOCK	>1B 69 36	
6	F6	SHIFT	>1B 69 42	
7	F7	NORMAL	>1B 69 37	
7	F7	CAPS LOCK	>1B 69 37	
7	F7	SHIFT	>1B 69 43	
8	F8	NORMAL	>1B 69 38	
8	F8	CAPS LOCK	>1B 69 38	
8	F8	SHIFT	>1B 69 44	
9	F9	NORMAL	>1B 69 39	
9	F9	CAPS LOCK	>1B 69 39	
9	F9	SHIFT	>1B 69 45	
10	F10	NORMAL	>1B 69 3A	
10	F10	CAPS LOCK	>1B 69 3A	
10	F10	SHIFT	>1B 69 46	
11	F11	NORMAL	>1B 69 3B	
11	F11	CAPS LOCK	>1B 69 3B	
11	F11	SHIFT	>1B 69 47	
12	F12	NORMAL	>1B 69 3C	
12	F12	CAPS LOCK	>1B 69 3C	
12	F12	SHIFT	>1B 69 48	
14	ESC	SHIFT	>1B 66	
14	ESC	CTRL		
15	CMD	NORMAL	>1B 68	
15	CMD	CAPS LOCK	>1B 68	
15	CMD	SHIFT	>1B 4C	
15	CMD	ALT	>1B 64	
16	ATTN	NORMAL	>1B 67	
16	ATTN	CAPS LOCK	>1B 67	

Key	Legend	Mode	Transmitted Code	Comment
16	ATTN	SHIFT	>1B 65	
16	ATTN	ALT	>1B 63	
17	INS	NORMAL	>1B 50	
17	INS	CAPS LOCK	>1B 50	
17	INS	SHIFT	>1B 50	
18	DEL	NORMAL	>1B 51	
18	DEL	CAPS LOCK	>1B 51	
18	DEL	SHIFT	>1B 4B	Erase input
19	ID/BREAK	NORMAL	>1B 4E	Blank gray
19	ID/BREAK	CAPS LOCK	>1B 4E	
20	PRINT	NORMAL	>1B 57	
20	PRINT	CAPS LOCK	>1B 57	
20	PRINT	SHIFT	>1B 57	
22	1 !	ALT	>7F	
23	2 @	CTRL		
23	2 @	ALT CTRL		
23	2 @	SHIFT CTRL	>00	
24	3 #	ALT	>1B 2A	
24	3 #	ALT CTRL		
25	4 $	ALT		
25	4 $	CTRL	>1C	
25	4 $	ALT CTRL		
26	5 %	ALT CTRL		
27	6 ^	CTRL		
27	6 ^	SHIFT CTRL	>1E	
27	6 ^	ALT CTRL		
28	7 &	CTRL		
28	7 &	ALT CTRL		
29	8 *	CTRL	>1F	
30	9 (	ALT	>0E OR 0F	
32	—	SHIFT CTRL	>1F	
34	\ ⌐	CTRL	>1C	
34	\ ⌐	SHIFT CTRL	>1C	
36	HOME	NORMAL	>1B 48	
36	HOME	CAPS LOCK	>1B 48	
36	HOME	SHIFT	>1B 48	
37	SEND	NORMAL		
37	SEND	NORMAL		
37	SEND	SHIFT		
38	=	ALT	>1B 73	Skip
39	+	ALT	>1B 3D	Erase field
40	SPACE	ALT		
41	TAB	SHIFT	>1B 32	
41	TAB	ALT		
41	TAB	CTRL		
42	TAB	SHIFT	>1B 32	
42	TAB	ALT	>1B 2B	
42	TAB	CTRL		
43	Q	SHIFT CTRL	>11	
43	Q	ALT CTRL		
44	W	SHIFT CTRL	>17	
44	W	ALT CTRL		
45	E	SHIFT CTRL	>05	
45	E	ALT CTRL		
46	R	SHIFT CTRL	>12	
46	R	ALT CTRL		
47	T	SHIFT CTRL	>14	
47	T	ALT CTRL		

Key	Legend	Mode	Transmitted Code	Comment
48	Y	SHIFT CTRL	>19	
48	Y	ALT CTRL		
49	U	SHIFT CTRL	>15	
49	U	ALT CTRL	>15	
50	I	ALT	>1B 41	
50	I	SHIFT CTRL	>09	
50	I	ALT CTRL	>09	
51	O	SHIFT CTRL	>0F	
51	O	ALT CTRL		
52	P	SHIFT CTRL	>10	
52	P	ALT CTRL	>10	
53	[{	SHIFT CTRL	>1B	
53	[{	ALT CTRL	>1B	
54	] }	SHIFT CTRL	>1D	
54	] }	ALT CTRL		
55	RETURN	ALT		
62	A	SHIFT CTRL	>01	
62	A	ALT CTRL	>01	
63	S	SHIFT CTRL	>13	
63	S	ALT CTRL		
64	D	SHIFT CTRL	>04	
64	D	ALT CTRL	>04	
65	F	SHIFT CTRL	>06	
65	F	ALT CTRL	>06	
66	G	SHIFT CTRL	>07	
66	G	ALT CTRL	>07	
67	H	ALT	>1B 74	
67	H	SHIFT CTRL	>08	
67	H	ALT CTRL	>08	
68	J	ALT	>1B 44	
68	J	SHIFT CTRL	>0A	
68	J	ALT CTRL	>0A	
69	K	ALT	>1B 42	
69	K	SHIFT CTRL	>0B	
69	K	ALT CTRL		
70	L	ALT	>1B 43	
70	L	SHIFT CTRL	>0C	
70	L	ALT CTRL		
71	; :	ALT	>1B 69 6F	
73	up arrow	NORMAL	>1B 41	
73	up arrow	CAPS LOCK	>1B 41	
73	up arrow	SHIFT	>1B 41	
80	Z	SHIFT CTRL	>1A	
80	Z	ALT CTRL		
81	X	SHIFT CTRL	>18	
81	X	ALT CTRL		
82	C	SHIFT CTRL	>03	
82	C	ALT CTRL		
83	V	SHIFT CTRL	>16	
83	V	ALT CTRL		
84	B	SHIFT CTRL	>02	
84	B	ALT CTRL		
85	N	SHIFT CTRL	>0E	
85	N	ALT CTRL		

Table D-1 931 Mode Transmitted Code Table (Continued)

Key	Legend	Mode	Transmitted Code	Comment
86	M	ALT	>1B 48	
86	M	SHIFT CTRL	>0D	
86	M	ALT CTRL		
91	<-	NORMAL	>1B 44	
91	<-	CAPS LOCK	>1B 44	
91	<-	SHIFT	>1B 44	
91	<-	ALT	>1B 74	Left field
92	->	NORMAL	>1B 43	
92	->	CAPS LOCK	>1B 43	
92	->	SHIFT	>1B 43	
92	->	ALT	>1B 69 6F	Right field
96	ENTER	NORMAL	>1B 69 71	
96	ENTER	CAPS LOCK	>1B 69 71	
96	ENTER	SHIFT	>1B 69 71	
98	spacebar	ALT		
98	spacebar	CTRL		
98	spacebar	ALT CTRL		
99	acute	NORMAL	>2C	
99	acute	CAPS LOCK		
99	acute	SHIFT	>3C	
100	degree/umlaut	NORMAL	>2E	
100	degree/umlaut	CAPS LOCK		
100	degree/umlaut	SHIFT	>3E	
101	down arrow	NORMAL	>1B 42	
101	down arrow	CAPS LOCK	>1B 42	
101	down arrow	SHIFT	>1B 42	

Table D-2 Difference Table for 931 Mode Protected Keyboard Modes

			Transmitted Code for Protected Key:		
Key	Legend	Mode	CTRL	ALT	ALT-CTRL
14	ESC	NORMAL	>1B 66	No code	>1B 66
14	ESC	CAPS LOCK	>1B 66	No code	>1B 66
14	ESC	SHIFT	>1B 66	No code	>1B 66
30	9 (	ALT	>0E/0F	No code	No code*
50	I	ALT	>1B 41	No code	No code
67	H	ALT	>1B 74	No code	No code
68	J	ALT	>1B 44	No code	No code
69	K	ALT	>1B 42	No code	No code
70	L	ALT	>1B 43	No code	No code
71	;	ALT	>1B 69 6F	No code	No code
86	M	ALT	>1B 48	No code	No code

NOTE:

* Key 30 in the (CTRL) protected keyboard mode alternates between >0E and >0F.

924 KITS FOR BUSINESS SYSTEMS
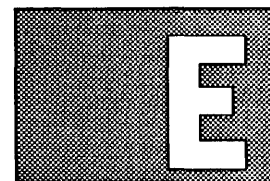
Introduction   Table E-1 lists the cable and kit part numbers needed to connect the 924 VDT to the Business System computers.

Table E-1 924 Kits for Business Systems

System	System Connection	Cable Part Number	Kit Part Number
S1500	4-Channel	2303077-0001	2543001-0001
S1500	Breakout Box	2230504-0002	2542966-0001
S1500	Modem	2532883-0001	2542999-0001
S300A	EIA	2230504-0002	2542966-0001
S300A	Modem	2532883-0001	2542999-0001
BS600/800	EIA	2303077-0001	2543001-0001
BS600/800	Modem	2532883-0001	2542999-0001
Bus. Pro	Multiplexer	2230504-0002	2542966-0001
Bus. Pro	Comm	2230504-0002	2542966-0001
Bus. Pro	Mother Board	2303071-0001	2543003-0001
Printer			
850/855		2230504-0001	2222477-0002
860/865		2230504-0001	2222477-0002
880/880DP		2230504-0001	2222477-0002

924 MODE
RECEIVED AND RECOGNIZED CODES
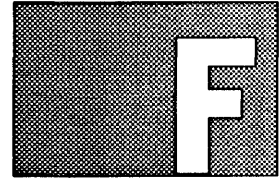
Introduction   This appendix lists 924 received codes, recognized C1 control codes and ISO/ANSI sequences, and ISO/ANSI modes supported by set/reset mode sequences.

Table F-1 924 Received Codes, C1 Control Codes Recognized, 924 Mode

Control Function Name	ISO/DEC Mnemonic	Received Code
Index	IND	8/4 or 1/11 4/4
Next line	NEL	8/5 or 1/11 4/5
Horizontal tab set	HTS	8/8 or 1/11 4/8
Reverse index	RI	8/13 or 1/11 4/13
Single shift 2	SS2	8/14 or 1/11 4/14
Single shift 3	SS3	8/15 or 1/11 4/15
Device control string	DCS	9/0 or 1/11 5/0
Control sequence introducer	CSI	9/11 or 1/11 5/11
String terminator	ST	9/12 or 1/11 5/12

Table F-2 924 Received Codes, ISO/ANSI Sequences Recognized, 924 Mode

Control Function Name	ISO/DEC Mnemonic		Received Code	Comments
Cursor backward tabulation	CBT		CSI Pn Z	
Cursor horizontal absolute	CHA		CSI Pn G	
Cursor horizontal tabulation	CHT		CSI Pn I	
Cursor next line	CNL		CSI Pn E	
Cursor preceding line	CPL		CSI Pn F	
Cursor left	CUB		CSI Pn D	
Cursor down	CUD		CSI Pn B	
Cursor right	CUF		CSI Pn C	
Cursor position	CUP		CSI Pl;Pc H	
Cursor up	CUU		CSI Pn A	
Device attributes	DA		CSI c or CSI 0 c	
Delete character	DCH		CSI Pn P	
Delete line	DL		CSI Pn M	
Device status report	DSR		CSI Pn n	
			CSI 0 n	Ready, no malfunction
			CSI 3 n	Error
			CSI 5 n	Report status
			CSI 6 n	Report cursor position
		DEC	CSI ? 1 0 n	Ready
		DEC	CSI ? 1 1 n	Not ready
		DEC	CSI ? 1 3 n	No print connection
		DEC	CSI ? 1 5 n	Report printer status
		DEC	CSI ? 2 0 n	UDKs are unlocked
		DEC	CSI ? 2 1 n	UDKs are locked
		DEC	CSI ? 2 5 n	Report UDK status
Erase character	ECH		CSI Pn X	
Erase in display	ED		CSI Pn J	
			CSI 0 J	
			CSI 1 J	
			CSI 2 J	
		DEC	CSI ? 0 J	Selective erase
		DEC	CSI ? 1 J	Selective erase
		DEC	CSI ? 2 J	Selective erase
Erase line	EL		CSI Pn K	
			CSI 0 K	
			CSI 1 K	
			CSI 2 K	
		DEC	CSI ? 0 K	Selective erase
		DEC	CSI ? 1 K	Selective erase
		DEC	CSI ? 2 K	Selective erase
Horizontal position absolute	HPA		CSI Pn '	' IS 6/0

Control Function Name	ISO/DEC Mnemonic		Received Code	Comments
Horizontal and vertical position	HVP		CSI Pl;Pc f	
Insert character	ICH		CSI Pn @	
Insert line	IL		CSI Pn L	
Media copy	MC		CSI 0 i	Print screen
			CSI 2 i	Read screen
			CSI 4 i	End transparent print
			CSI 5 i	Begin transparent print
		TI	CSI 6 i	End external loopback
		TI	CSI 7 i	Begin external loopback
		DEC	CSI ? 1 i	Print line
		TI	CSI ? 3 i	Read screen row
		DEC	CSI ? 4 i	End auto print mode
		DEC	CSI ? 5 i	Begin auto print mode
		TI	CSI ? 9 i	End X-PRINT with pacing
Reset mode	RM		CSI Ps;Ps;Ps l	See mode table F-3
Select character attributes	SCA	DEC	CSI Ps 2/2 q	
	DEC		CSI 0 2/2 q	
		DEC	CSI 1 2/2 q	
		DEC	CSI 2 2/2 q	
Select graphic rendition	SGR		CSI Pn m	
			CSI 0 m	All attributes off
			CSI 1 m	Bold
			CSI 4 m	Underscored
			CSI 5 m	Blinking
			CSI 7 m	Reverse image
			CSI 22 m	Normal intensity
			CSI 24 m	Not underlined
			CSI 25 m	Not blinking
			CSI 27 m	Positive image
Set top, bottom margins	STBM	DEC	CSI Pt;Pb r	
Soft terminal reset	STR	DEC	CSI 2/1 p	
Set mode	SM		CSI Ps;Ps;Ps h	See mode table F-3
Tab clear	TBC		CSI Ps g	
			CSI 0 g	Active position clear
			CSI 3 g	All tabs cleared
Tests	TST	DEC	CSI 4 ; 0 y	
		DEC	CSI 4 ; 1 y	
		DEC	CSI 4 ; 2 y	
		DEC	CSI 4 ; 3 y	
		DEC	CSI 4 ; 4 y	
		DEC	CSI 4 ; 5 y	
		DEC	CSI 4 ; 6 y	
		DEC	CSI 4 ; 9 y	
Alignment test	ALN	DEC	1/11 2/3 3/8	
Designate into G0 (94 characters)			1/11 2/8 Ps	

Control Function Name	ISO/DEC Mnemonic		Received Code	Comments
Designate into G1 (94 characters)			1/11 2/9 Ps	
Designate into G2 (94 characters)			1/11 2/10 Ps	
Designate into G3 (94 characters)			1/11 2/11 Ps	
Designate into G1 (96 characters)			1/11 2/13 Ps	
Designate into G2 (96 characters)			1/11 2/14 Ps	
Designate into G3 (96 characters)			1/11 2/15 Ps	
Double height top row	DHTR	DEC	1/11 2/3 3/3	
Double height bottom row	DHBR	DEC	1/11 2/3 3/4	
Double width row	DWR	DEC	1/11 2/3 3/6	
Dynamic redefinable character set load	DLD	DEC	DCS Pfn;Pcn;Pe;Pcms;Pwt;Pt 7/11 Dscs Sxbp1;Sxbp2; . Sxbpn ST	
ENQ ID	ENQID	DEC	1/11 5/10	
Lock shift 1R	LS1R		1/11 7/14	
Lock shift 2R	LS2R		1/11 7/13	
Lock shift 3R	LS3R		1/11 7/12	
Lock shift 2	LS2		1/11 6/14	
Lock shift 3	LS3		1/11 6/15	
Reset to initial state	RIS		1/11 6/3	
Restore cursor	RC	DEC	1/11 3/8	
Save cursor	SC	DEC	1/11 3/7	
Select 7-bit C1 controls	S7C1T		1/11 2/0 4/6	
Select 8-bit C1 controls	S8C1T		1/11 2/0 4/7	
Single width row	SWR	DEC	1/11 2/3 3/5	
User-definable key control string	UDK	DEC	DCS Pc;Pl 7/12 KYN/STN; .... ST	

Table F-3 ISO/ANSI Modes Supported by Set/Reset Mode Sequences, 924 Mode

Name	ISO/DEC Mnemonic		Mode Parameter	Comments
Keyboard action	KAM		3/2	
Insertion replacement mode	IRM		3/4	
Send/receive mode	SRM		3/1 3/2	
Line feed/newline	LNM		3/2 2/0	
Cursor blink/stable			3/0 3/0	
Cursor key mode	CKM	DEC	3/15 3/1	Always cursor in 924
ANSI/VT52	ANM	DEC	3/15 3/2	Always ANSI in 924
Column select	COLM	DEC	3/15 3/3	
Scroll select	SCLM	DEC	3/15 3/4	
Screen mode	SCNM	DEC	3/15 3/5	
Origin	OM	DEC	3/15 3/6	
Auto wrap	AWM	DEC	3/15 3/7	
Auto repeat	ARM	DEC	3/15 3/8	
Printer form feed	PFF	DEC	3/15 3/1 3/8	
Printer extent	PEX	DEC	3/15 3/1 3/9	
Printer form feed	PFF	DEC	3/15 3/1 3/8	
Cursor display	TCEM	DEC	3/15 3/2 3/5	
Media copy host transmit sgr			3/15 3/5 3/0	
Media copy print controls mode			3/15 3/5 3/1	
Media copy host controls mode			3/15 3/5 3/2	

924 VDT EMULATION OF 931 VDT
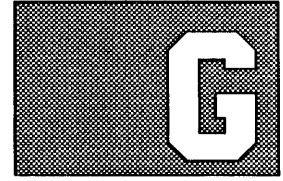
Operational Differences

G.1 If you are familiar with the 931 VDT, you will notice certain differences when operating the 924 VDT in 931 mode. The most significant changes are in the areas of terminal configuration, status indicators, and key mapping. The paragraphs below list some differences to be aware of when operating a 924 VDT in 931 mode.

Display Control Differences

G.1.1 The 931 VDT screen contains a 25th status line which indicates communication status and auxiliary device status. Similar status indicators appear on the 924 VDT set-up screens (see Section 5, Set-Up).

Table G-1

Display Control Differences

Function	931 VDT Key	924 VDT Key/931 Mode
Status line on/off	ALT-2	No status line
Online/offline	ALT-4	Set-Up Directory screen
Reverse background	ALT-5	Display Set-Up screen
Brightness up	ALT-7	Physical control*
Brightness down	ALT-8	Physical control*
Bell on/off/volume	ALT- –	Keyboard Set-Up screen**

Notes:

* The brightness control on the 924 VDT is a rotary dial, as shown in Figure 3-1. Contrast is adjusted in set-up, as described in paragraph X.X.X.

** The 931 VDT offers a range of bell volume settings. The 924 VDT only allows you to turn the warning bell and the margin bell on and off.

Key Mapping Differences

G.1.2 Certain legends on the 931 VDT keyboard are not present on the 924 VDT keyboard. All 931 functions have been mapped onto the 924 keyboard in 931 mode operation, as shown in Table G-2.

Table G-2

Key Mapping Differences

931 VDT Key	924 VDT Key/931 Mode
FIELD->	(ALT) right arrow
<-FIELD	(ALT) left arrow
blank orange	ATTN
(SHIFT) blank orange	(SHIFT) ATTN
(ALT) blank orange	(ALT) ATTN
blank gray	ID or (SHIFT) INS
(SHIFT) blank gray	(ALT) degree/umlaut
SKIP	(ALT) = (NUM)
(ALT) SKIP	(ALT) '
ERASE FIELD	(ALT) + (NUM)
(SHIFT) ERASE FIELD	(ALT) acute accent
(ALT) ERASE FIELD	(ALT) down arrow
ERASE INPUT	(ALT) DEL
(SHIFT) ERASE INPUT	(ALT) <=X
(ALT) ERASE INPUT	(ALT) up arrow
ENTER	ENTER or SEND
(ALT) = (NUM)	(ALT) 7 (NUM)
(ALT) + (NUM)	(ALT) 8 (NUM)
(ALT) space (NUM)	(ALT) 9 (NUM)
DEL CHAR	DEL
(SHIFT) DEL CHAR	(SHIFT) DEL
INS CHAR	INS
(SHIFT) INS CHAR	INS

Programming Differences

G.2 The 924 VDT's emulation of the 931 VDT is quite complete. For detailed information on programming the 924 VDT in 931 mode, refer to the *Model 931 Video Display Terminal General Description* manual, TI part number 2229228-0001. 931 mode facilities are not necessarily identical to 924 mode facilities when accessed with a different encoding.

G.2.1 Some 931 VDT escape sequences produce slightly different results on the 924 VDT in 931 mode. Table G-3 lists the 931 escape sequences with differences in their interpretation.

Table G-3

924 VDT 931 Mode Programming Differences

Control Function Name	Received Code	Comments
Write to/select alt status line	1/11 4/7 4/11	Command parsed and ignored*
Restore primary status line	1/11 4/7 4/12	Command parsed and ignored*
Write to message area	1/11 4/7 4/1	Command parsed and ignored*
Erase message	1/11 3/12	Command parsed and ignored*
Read status	1/11 3/6	See Note 2**

Notes:

* The 924 VDT does not have a 25th status line. All status line commands and any associated data are parsed and discarded by the 924 terminal when in 931 mode.

** The format of the response to the 931 Read Status command is the following:

```
RESPONSE TO READ STATUS -924 TERMINAL/931 MODE
  BYTE #                  USAGE
    1                     RESERVED= 4/0     ASCII=@
    2                     RESERVED= 4/0     ASCII=@
    3                     RESERVED= 4/0     ASCII=@
    4                     VERSION IDENTIFIER= 4/2. ASCII=B
    5                     CURSOR/VIDEO STATUS
    6                     PARITY ERROR STATUS
    7                     AUX DEVICE STATUS
    8                     RESERVED= 4/0     ASCII=@
    9                     CHARACTER SET STATUS
   10                     KEYBOARD LOCK STATUS
   11                     RESERVED= 4/0     ASCII=@
   12                     RESERVED= 4/0     ASCII=@
   13                     RESERVED= 4/0     ASCII=@
```

Some 931 VDT commands are not emulated by the 931 mode of the 924 VDT. A listing of those commands is provided in Table G-4

Table G-4   **924 VDT 931 Mode Commands Not Implemented**

Control Function Name	Received Code							
Define comm parms	1/11	4/7	4/13					
Define AUX1 parms	1/11	4/7	4/14					
Enable personality mode	1/11	7/7	3/0					
Disable personality mode	1/11	7/7	3/1					
Reset NV memory	1/11	4/7	4/9	1/11	2/8	3/0	1/11	2/9
Execute RAM test	1/11	4/7	4/9	1/11	2/8	3/1	1/11	2/9
Verify all ROMs	1/11	4/7	4/9	1/11	2/8	3/2	1/11	2/9
Barberpole all character sets	1/11	4/7	4/9	1/11	2/8	3/3	1/11	2/9
Enter keyboard test mode	1/11	4/7	4/9	1/11	2/8	3/5	1/11	2/9
Exit keyboard test mode	1/11	4/7	4/9	1/11	2/8	3/6	1/11	2/9
Display screen adjust pattern	1/11	4/7	4/9	1/11	2/8	3/4	1/11	2/9
Enter factory test mode								
Execute test								

931 Mode GRA Repertoire

G.2.2 The 931 VDT is a 7-bit terminal with two permanently designated character sets: a national character set (G0) and the 931 Line Drawing Graphics character set (G1).

Three national character sets are available, as shown in the following list. They are selected via the keyboard parameter in the Set-Up Directory screen. The national character set is designated into G0 and invoked into GL upon power-up.

■ USASCII — Identical to the USASCII character set implemented in 924 mode. (See Table 7-2.)

■ UKASCII — Identical to the UKASCII character set implemented in 924 mode. (See Table 7-3.)

■ Spanish 7-Bit National character set — Not implemented in this version of the 924 VDT.

The 931 Line Drawing Graphics character set is designated into G1. The 931 mode implementation is identical to the mapping shown in Table 7-5. In the 931 VDT, positions 4/1 through 7/14 in the line drawing graphics characters are undefined and normally display as spaces. The 924 implementation has extended this definition such that character positions 4/1 through 7/14 of the line drawing are defined to be identical to the symbols in the USASCII code table.

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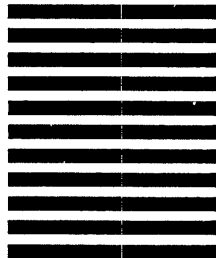 for printers 6-4

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