Table 5-1. Entries Used to Define Field Control Sequence Characteristics

Sequence	Data Key	Field Characteristics
First data key (Intensity)	SPACE BAR or N	Normal-intensity characters
	L	Half-intensity characters
	O	Off-intensity; cursor moves but characters do not appear on screen
	B or 5	Blinking characters (from low to half-intensity)
	1	Reverse-video; normal-intensity background
	2	Reverse-video; half-intensity background
	3	Reverse-video; blinking background (from normal-intensity to half-intensity)
	4	Reverse-video; blinking background (from half-intensity to low-intensity)
Second data key (Tab stop)	SPACE BAR or S	No tab stop
	T	Tab stop at cursor location
	6	Tab stop; special emphasis characters protected
	7	No tab stop; special emphasis characters protected
Third data key (Data entry)	SPACE BAR or U	Unprotected, any entry accepted
	P	Protected, no entry accepted
	A	Alphabetic entry only
	N	Numeric entry only
Fourth data key (Justification)	SPACE BAR	Normal data entry
	R	Right-justified data entry
Fifth data key (End field control character)	SPACE BAR	End field control character, activate intensity and tab selections

Changing Field Attributes

To change the characteristics of a field, press the FCC LOCATE key to move the cursor to the desired field. Create a new field as previously described.

Duplicating Fields

A line containing one or more fields (such as tab stops for columnar data) can be duplicated by positioning the cursor anywhere on the line and pressing the LINE DUP key. The duplicate line will be copied on to the row below the cursor, overwriting any existing data and fields on that line.

Clearing a Single Field

Clearing a field removes the sequence and its attributes, such as intensity, without affecting the data in the field.

Find the field to be removed by pressing the FCC LOCATE key. Alternatively, use the cursor control keys to position the cursor within the field.

Clearing Multiple Fields

The following methods can be used to clear several fields at once, eliminating any data in those fields. In either case, the area that has been cleared of fields becomes part of the previous field.

- Erase all characters and fields from the cursor position to the end of the display by moving the cursor to the first position of the area to be erased. Press ERASE DISPLAY.
- Eliminate all fields in a line by moving the cursor to the line to be erased and pressing DELETE LINE.

Section 6
Host Programming Considerations

The PWT 120 communicates with the host computer using UNISCOPE protocol, a protocol that is compatible with the Unisys UNISCOPE and UTS 4000 family terminals. The protocol provides a synchronous, block mode method of error-free communication. This chapter provides an overview of the protocol functions supported by the PWT 120. For more detailed information, refer to the Unisys *UNISCOPE Protocol Reference Manual,* UP-10683.

Screen Control Codes

The terminal supports a variety of screen positioning, field, and editing functions. The codes sent from the host are found in the 7-bit ASCII code chart in Appendix B. When the terminal receives one of these codes from the host, it performs the specified function.

Cursor Positioning Codes

The host processor can position the cursor by any of the following codes:

Function	Code
Cursor positioning	ESC VT Y X SI
Cursor to home	ESC e
Cursor return	CR
Scan up	ESC f
Scan left	ESC g
Scan right	ESC h
Scan down	ESC i
Forward tab	HT
Back tab	ESC z
Field control character sequence	US Y X M N

Screen Position Addressing

The screen contains 24 lines and either 80 or 132 columns. The host cannot change the operator-selected screen size. If the column address (X) is 1 through 80, the basic screen addresses (column 2 through 6 of the ASCII code chart) apply. If the column address is greater than 80, the extended addressing consists of two characters between 70 (hex) and 7F (hex). The four lower order bits of each character are combined to form an 8-bit address. For example, if the first character is 75 (hex) and the second character is 7A (hex), the resultant address in hexadecimal is 5A, which indicates row or column 91. (Refer to the *UNISCOPE Protocol Reference Manual,* UP-10683, for additional information.)

Field Control Sequences

The terminal sends expanded or non-expanded field control sequences depending on the option selected in the host control page. If the "disable expanded FCC" (TD/DF) option is selected, the expanded color field control sequences are not supported. If the "enable expanded FCC" (TF/EF) option is selected, the UTS 20-compatible field control sequences with M or N characters less the 30 (hex) are not supported.

The field control sequence characteristics supported by the terminal are defined in the following tables. Tables 6-1 and 6-2 define the ASCII characters used as N in the extended field control sequence. Tables 6-3 and 6-4 define the ASCII characters used as M in the UTS 400-compatible field control sequence.

Table 6-1. ASCII Characters Used as M in the Expanded FCC Sequence

Bit 3 Tab Status	Bit 2 Changed Data	Bit 1 Intensity*	Bit 0 Video	Bit 5 Emphasis Is Not Protected	Bit 5 Emphasis Is Proteceted
Tab Stop	Field Changed	Normal Intensity	Video on	40	60
			Video off	A 41	a 61
		Low Intensity	Video on	B 42	b 62
			Video off	C 43	c 63
	Field Not Changed	Normal Intensity	Video on	D 44	d 64
			Video off	E 45	e 65
		Low Intensity	Video on	F 46	f 66
			Video off	G 47	g 67

continued

Table 6-1. ASCII Characters Used as M in the Expanded FCC Sequence (cont.)

Bit 3 Tab Status	Bit 2 Changed Data	Bit 1 Intensity*	Bit 0 Video	Bit 5 Emphasis Is Not Protected	Bit 5 Emphasis Is Proteceted
No Tab Stop	Field Changed	Normal Intensity	Video on	H 48	h 68
			Video off	I 49	i 69
		Low Intensity	Video on	J 4A	j 6A
			Video off	K 4B	k 6B
	Field Not Changed	Normal Intensity	Video on	L 4C	l 6C
			Video off	M 4D	m 6D
		Low Intensity	Video on	N 4E	n 6E
			Video off	O 4F	o 6F

Table 6-2. ASCII Characters Used as N in the Expanded FCC Sequence

Bit 3 Blinking	Bit 2 Justification	Bit 1, 0 Type of Data Entry	Bit 4 Normal Intensity	Bit 4 Reverse Video
No Blink	Normal Field	Any	40	50
		Alpha	A 41	a 51
		Numeric	B 42	b 52
		Protected	C 43	c 53
	Right-Justified	Any	D 44	d 54
		Alpha	E 45	e 55
		Numeric	F 46	f 56
		Protected	G 47	g 57

continued

Table 6-2. ASCII Characters Used as N in the Expanded FCC Sequence (cont.)

Bit 3 Blinking	Bit 2 Justification	Bit 1, 0 Type of Data Entry	Bit 4 Normal Intensity	Bit 4 Reverse Video
Blinking	Normal Field	Any	H 48	h 58
		Alpha	I 49	i 59
		Numeric	J 4A	j 5A
		Protected	K 4B	k 5B
	Right-Justified	Any	L 4C	l 5C
		Alpha	M 4D	m 5D
		Numeric	N 4E	n 5E
		Protected	O 4F	o 5F

Table 6-3. ACSII Characters Used as M in the UTS 400-Compatible FCC Sequence

Tab Stop	Field Changed	Normal intensity	0 30
		Video off	1 31
		Low intensity	2 32
		Blinking	3 33
	Field Not Changed	Normal intensity	4 34
		Video off	5 35
		Low intensity	6 36
		Blinking	7 37
No Tab Stop	Field Changed	Normal intensity	0 30
		Video off	1 31
		Low intensity	2 32
		Blinking	3 33
	Field Not Changed	Normal intensity	4 34
		Video off	5 35
		Low intensity	6 36
		Blinking	7 37

Table 6-4. ASCII Characters Used as N in the UTS 400-Compatible FCC Sequence

Normal Field	Any	0 30
	Alpha	1 31
	Numeric	2 32
	Protected	3 33
Right-Justified	Any	4 34
	Alpha	5 35
	Numeric	6 36
	Protected	7 37

Emphasis Underline

The terminal provides an emphasis underline that can be displayed in the same position as a data character. The emphasis underline can be protected without protecting the data characters appearing in the same position (see Table 6-1). The emphasis underline command sequences are:

Function	Code
Create emphasis	ESC $
Delete emphasis	ESC Z $

Editing

The available editing capabilities are listed in the following table. Refer to the *UNISCOPE Protocol Reference Manual,* UP-10683, for an explanation of these functions.

Function	Code
Erase to end of display	ESC a
Erase to end of field	ESC K
Erase to end of line	ESC b
Erase display	ESC M
Delete in line	ESC c
Delete in display	ESC C
Delete line	ESC k
Insert in line	ESC d
Insert in display	ESC D
Insert line	ESC j
Line duplicate	ESC y
Clear field control character	ESC w

Additional Host Functions

The additional host functions that are supported are:

Function	Code
Start protected characters	SO
Start unprotected characters	SI
Keyboard lock	DC4 or ESC DC4
Tab stop set	ESC HT
Send cursor address	ESC T
Place 8-bit ESC (9B) on screen	ESC [
Sound bell	BEL

Peripheral Initiation Commands

The only peripheral device is a printer. The terminal supports only the print commands listed here. Refer to the *UNISCOPE Protocol Reference Manual,* UP-10683, for information on how to select the printer. The printer device identifier (DID) is always 73 (hex). The DID can not be changed.

Control Page Equivalent	Code
Print PRNT	DC2
Print FORM	ESC H
Print XPAR	ESC DC2
Print ALL	ESC G

Transmit Initiation Commands

The terminal supports the following transmit initiation commands:

Control Page Equivalent	Code
Transmit VAR	DC1
Transmit ALL	ESC DC1
Transmit CHAN	ESC t

Host Control Page

Although the terminal provides control page displays for operator convenience (see Section 2), the Host Control page is supported for host programming only. The Host Control page is not displayed.

The PRNT, XMIT and PARAM fields are the allowable fields that the host can modify. (See Table 6-5.) Table 6-6 lists the allowable entries for the PRNT and XMIT fields. Table 6-7 lists the parameters and options for the PARAM field.

Table 6-5. Host Control Page Allowable Entries

Field	Allowable Entries
PRNT	PRNT XPAR FORM
XMIT	ALL VAR CHAN
PARAM	(See Table 6-7.)

Table 6-6. Allowable Entries for PRNT and XMIT Fields

Field	Number of TABs
PRNT	0
XMIT	2
PARAM	11

Table 6-7. Allowable Entries for PARAM Field

Parameter	Parameter Code	Option Code	Function
Remote Identifier**	RI	21-7E	Specifies the remote site transmission code (RID).
Station Identifier**	SI	20-7F	Specifies the terminal transmission code (SID).
System Response Mode**	SR	ON	Enables System Response Mode for the PWT 120.
		OF*	Disables System Response Mode.

continued

Table 6-7. Allowable Entries for PARAM Field

Parameter	Parameter Code	Option Code	Function
SITA Timing Requirements	ST		Specifies maximum time that RTS line is allowed to be active. The normal time is 45 seconds. The SITA requirement is 0.5 seconds or less.
		YS	Enables SITA timing requirements.
		NO*	Disables SITA timing requirements.
Space bar selection	SP	NS*	Defines the space bar as nondestructive.
		DS	Defines the space bar as destructive.
Key click	KK	ON*	Makes the key clicks audible.
		OF	Makes the key clicks inaudible.
Communications Mode**	CM	MX*	Identifies the communications link to the host as a multiplexer.
		MD	Identifies the communications link to the host as a modem or DCM.

continued

Table 6-7. Allowable Entries for PARAM Field

Parameter	Parameter Code	Option Code	Function
Uppercase	UC	YS	The SHIFT key affects all alphanumeric and other displayable character keys.
		NO*	Allows the normal entry of uppercase and lower case alphabetic characters.
Transmit expanded field control characters	TF	DF*	Disables the transmission of expanded field control characters
		EF	Enables the transmission of expanded field control characters.
Automatic hangup**	AA		Selects the length of an inactive period before the communications line is disconnected from the host processor. The terminal will hang up after:
		Y1	30 seconds.
		Y2	1 minute.
		Y3	3 minutes.
		Y4	5 minutes.
		NO*	Does not hang up.

*Default option.

**The terminal must be reset to enable these parameters.

Since the Host Control page is not formatted screen memory, the usual cursor positioning operations are not supported. Field selection is made by issuing specific numbers of TAB characters, as shown in Table 6-6.

The host accesses the Host Control page by issuing a text message with an ESC o command. Fields are accessed by sending sufficient tab stops to identify the corresponding field to be altered, followed by the field entries. The entries are executed by an ESC o to terminate the Host Control page access.

Each parameter that is changed requires the ESC o, tabs, and entry code, followed by an ESC o.

For example, from the host, an ESC o command would initial the control page screen. Eleven TAB commands (HT) would align the entry with the PARAM field. "RI21" would set the RID to 021 and an ESC o command would invoke the RID change.

Second Screen Capability

The PWT 120 supports the second screen capability only if the operator configures the terminal for two 80-column screens. If the second screen is configured, the terminal automatically assigns the screen 2 SID as one number higher than the screen 1 SID.

Nonsupported UNISCOPE Commands

The terminal ignores the UNISCOPE commands shown in Table 6-8:

Table 6-8. UNISCOPE Commands Ignored by the PWT 120

Code	Function
ESC P	Call error log
ESC R	Clear error log
ESC E	Transfer changed
ESC F	Transfer variable
ESC Y Sp-/	Modify emphasis

Section 7
Printers

Printer Operation

The PWT 120 provides one printer port for output printing of data. This port is used to attach an EIA RS-232C printer. The printer is assumed to be a character-mode, buffered device running full-duplex using XON/XOFF or READY/BUSY protocols.

The PWT 120 provides for two logical modes of printer support: the UTS-type mode and the PC-type mode. These modes differ by the type of error reporting required by the printer.

The UTS-type printer requires special Unisys protocols to allow the terminal to maintain error-free host communication.

The PC-type printer does not use special error reporting or timing. The printer functions are allowed to proceed with no special controls. Line feed (LF) characters on the display are translated to carriage returns (CR) on output to the PC-type printer. When using PC-type printers, the host timing may have to be extended to accommodate the additional buffering these printers use.

Printer Interface

The printer interface connector is a 25-pin female D-type. The printer port is a full-duplex, RS-232C asynchronous port which can operate at 2400, 4800, or 9600 baud. The data format is eight bits with parity selectable. Table 7-1 describes the pin configuration of the printer connector.

Table 7-1. Printer Connector Pin Assignments

Pin	I/O	Signal
1		Protective ground
2	IN	Receive data
3	OUT	Transmit data

continued

Table 7-1. Printer Connector Pin Assignments (cont.)

Pin	I/O	Signal
4	IN	Request to send
5	OUT	Clear to send
6	OUT	Data set ready
7	IN	Signal ground
20	IN	Data terminal ready

Printer Set-Up

The communication parameters set into the terminal must match those set into the printer. For standard Unisys printers, the following should be selected on the Communications Control page and the printer, where applicable:

1. 8-Bit data word
2. DSR set to ON
3. ASYNC full duplex with one start and one stop bit

Furthermore, the following parameters should be used, but are not required:

1. Communication rate set to 9600 KB
2. Printer READY/BUSY selected over XON/XOFF
3. EPSON printer emulation

Printer Operation

The basic philosophy for printing is that data is first placed on the screen and then the print initiated. These operations can be done manually from the keyboard or under host application control. Described elsewhere in this document are the print initiation commands and the print format options using FCCs.

For most applications, the data to be printed is delineated by an SOE on the screen or by the start of the screen if no SOE is present, and the position of the cursor.

The added functionality of the currently available async RS-232 printers (referred to as PC printers) has necessitated enhancements to the print capability of the PWT terminal. The PWT 120 has three major additions from the previous Unisys standard terminals. They are:

1. The PC printer communication is set for an 8-bit data word
2. A new host print command is provided. It is called PRINT ALL and is invoked by issuing ESC G as the print initiation command.
3. The ESC [command places an 8-bit CSI (9B) on the screen if UTS printer is specified and a 7-bit ESC (1B) if PC printer is specified.

There is one operational restriction to using the new functionalities in the printer. The terminal must be configured for the US character set (not to be confused with the Control Page Language). Unwanted character translations will occur in the other non-US character sets for values above 127 (decimal). Also, since the values in the range from (decimal) 128 through 255 are used internally to display non-US characters and a number of special symbols, these characters and symbols may be displayed during the time that the printer control sequences are on the screen.

The PRINT ALL command has substantially different operating characteristics from the standard UNISCOPE commands. Data to be printed is delineated by the start of screen (not the SOE) and the cursor. All data, including SOEs and the character under the cursor, is sent to the printer. In this mode, there are no assumed print format or initiation characters. New lines are specified by LFs or CRs. A print initiation character (CR, LF or FF) must be intentionally placed at the end of the data on the screen to assure complete printing of the image.

The host sends commands to the printer by placing them on the terminal screen and issuing a host printer initiation command. As the host communications protocol specifies 7-bit data and reserves certain control characters for specific use, not all bit patterns can be passed through from the host to the screen display.

The following message sequence places any numerical value on the screen and avoids the 7-bit and control character problems:

`ESC { n }`
where:

ESC is the ASCII Escape character 1B (hexadecimal)

n is any decimal numeric from 0 through 255

{ is the left brace ASCII character, 7B (hexadecimal)

} is the right brace ASCII character, 7D (hexadecimal)

Note: *Control characters (those with values from 0-31 decimal) are used as commands to the terminal screen processor, and values from 128-255 are too large to be passed on the communications line. If any value in these ranges is to be sent to the printer, it must be placed on the screen with the above ESC command.*

As an example, to set the printer (Epson emulation) to a form length of 8 inches, the following sequence is sent in a text message to the terminal from the host:

```
. . . ESC {27} C ESC {0} ESC {8}
```

where:

ESC {27} places an ESC on the screen

C places a C on the screen

ESC {0} places a null or zero value on the screen

ESC {8} places a numeric value of 8 on the screen

This data, when placed on the screen, is then sent to the printer with the new PRINT ALL command.

Print Hints

1. Clear the screen before building print image.
2. Remember that the character under the cursor is also printed.
3. Send control sequences to the printer prior to building the print image on the screen.
4. If the PRINT ALL print command is used, a character that causes the printer to dump its internal buffer must follow the last character of the page image (LF, CR, FF). Depending on how the printer is configured, this may cause an unwanted line feed on the printer. This must be included in the print format plans.

Appendix B
ASCII Code Charts

Table B–1. 7–Bit ASCII Code Chart

COL / ROW	0		1		2		3		4		5		6		7	
0	0 0 0	NUL	20 16 10	DLE	40 32 20	SP	60 48 30	0	100 64 40	@	120 80 50	P	140 96 60	`	160 112 70	p
1	1 1 1	SOH	21 17 11	DC1 (XON)	41 33 21	!	61 49 31	1	101 65 41	A	121 81 51	Q	141 97 61	a	161 113 71	q
2	2 2 2	STX	22 18 12	DC2	42 34 22	"	62 50 32	2	102 66 42	B	122 82 52	R	142 98 62	b	162 114 72	r
3	3 3 3	ETX	23 19 13	DC3 (XOFF)	43 35 23	#	63 51 33	3	103 67 43	C	123 83 53	S	143 99 63	c	163 115 73	s
4	4 4 4	EOT	24 20 14	DC4	44 36 24	$	64 52 34	4	104 68 44	D	124 84 54	T	144 100 64	d	164 116 74	t
5	5 5 5	ENQ	25 21 15	NAK	45 37 25	%	65 53 35	5	105 69 45	E	125 85 55	U	145 101 65	e	165 117 75	u
6	6 6 6	ACK	26 22 16	SYN	46 38 26	&	66 54 36	6	106 70 46	F	126 86 56	V	146 102 66	f	166 118 76	v
7	7 7 7	BEL	27 23 17	ETB	47 39 27	'	67 55 37	7	107 71 47	G	127 87 57	W	147 103 67	g	167 119 77	w
8	10 8 8	BS	30 24 18	CAN	50 40 28	(	70 56 38	8	110 72 48	H	130 88 58	X	150 104 68	h	170 120 78	x
9	11 9 9	HT	31 25 19	EM	51 41 29	)	71 57 39	9	111 73 49	I	131 89 59	Y	151 105 69	i	171 121 79	y
10	12 10 A	LF	32 26 1A	SUB	52 42 2A	*	72 58 3A	:	112 74 4A	J	132 90 5A	Z	152 106 6A	j	172 122 7A	z
11	13 11 B	VT	33 27 1B	ESC	53 43 2B	+	73 59 3B	;	113 75 4B	K	133 91 5B	[	153 107 6B	k	173 123 7B	{
12	14 12 C	FF	34 28 1C	FS	54 44 2C	,	74 60 3C	<	114 76 4C	L	134 92 5C	\	154 108 6C	l	174 124 7C	|
13	15 13 D	CR	35 29 1D	GS	55 45 2D	–	75 61 3D	=	115 77 4D	M	135 93 5D	]	155 109 6D	m	175 125 7D	}
14	16 14 E	SO	36 30 1E	RS	56 46 2E	.	76 62 3E	>	116 78 4E	N	136 94 5E	^	156 110 6E	n	176 126 7E	~
15	17 15 F	SI	37 31 1F	US	57 47 2F	/	77 63 3F	?	117 79 4F	O	137 95 5F	_	157 111 6F	o	177 127 7F	DEL

C0 CODES — GL CODES (ASCII CHARACTERS)

KEY:

OCTAL	33	ESC CHARACTER
DECIMAL	27	
HEX	1B	

Figure B-1. 7-Bit ASCII Code Chart

Table B-2. National Character Set Variations

Hexadecimal Locations in ASCII Code Chart												
Standard Character Sets	**23**	**24**	**40**	**5B**	**5C**	**5D**	**5E**	**60**	**7B**	**7C**	**7D**	**7E**
Domestic (USA)	#	$	@	[	\	]	^	`	{	|	}	~
Spain	Pt	$	§	¡	Ñ	¿	^		°	ñ		~
Denmark/Norway	#	$	@	Æ	Ø	Å	^	`	æ	ø	å	—
France	£	$	à	°	ç	§	^	`	é	ù	è	..
Germany	#	$	§	Ä	Ö	Ü	^	`	ä	ö	ü	ß
Sweden/Finland	#	¤	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
United Kingdom	£	$	@	[	\	]	^	`	{	|	}	~
Italy	£	$	§	°	#	é	^	ù	à	ò	è	ì

Figure B-2. National Character Set Variations