

AMBASSADOR USER GUIDE

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## INTRODUCTION.

The Ann Arbor Ambassador is an advanced, user-configurable, full-featured, ANSI-standard terminal.

**ADVANCED.** The Ambassador gives you a 15-inch screen with large crisp characters. If you've been working at a 12-inch, you'll appreciate the difference. You can 'zoom' up to 60 lines onto the screen whenever you want (to see what a printout will look like, or to see something that scrolled by too fast, or just for context), while working normally at whatever screen format you find most comfortable (all the way down to 18 lines). No other terminal gives you that capability.

And the Ambassador is fast. Anything that would slow down the terminal is done with hardware. (Most terminals do everything they can with firmware to save cost but, if that costs you time, it's no savings.) For example, when you insert a line into the Ambassador's display, you're not moving all the data that follows, in memory. That takes time. With the Ambassador, you're just up-dating a couple of line pointers (that control the order in which the lines are displayed).

**USER-CONFIGURABLE.** The Ambassador does everything possible to make your life easier. It lets you set whether you want a key click, or a margin bell. Whether you want your keys to repeat, and how fast. Whether you want a block or an underline cursor, and whether you want it to blink. It gives you a PAUSE key with which you can start and stop data from the host, including stepping in a line at a time (or a window at a time).

It gives you lots of Programmable keys, and not just the ones up in the Function pad, but the whole Numeric pad, and the corner keys on the Main array. You can load them with your most-used host (or application) commands, for one keystroke execution, or with control strings that execute complex special functions you want to perform.

It gives you a Programmable Power-on string, so that if you don't like some of our design decisions (like our default key codes or tab stop positions), you can change them. The Power-on string is executed each time the terminal is powered on. Load it with the key codes, or tab stop positions, you want, and the terminal initializes to your choices.

**FULL-FEATURED.** The Ambassador can do just about everything you want a terminal to do: Move/set either of two independent cursors. Read/save/restore their position. Erase/edit/move data in every conceivable way. Set up multiple pages and windows. Create/use forms, quickly and easily, designed the way you want them. Read/send screen with complete control over the region(s) sent, and with the data compressed as much or as little as you want. Print

from the screen or host or both, easily, with complete control of the content and the format of the printout. And we've tried to provide these functions in a form that is natural, logically consistent, and without exceptions.

**ANSI-STANDARD.** The Ambassador is based on the ANSI standard, X3.64, which standardized the coding to be used for control of display and printer terminals. Nearly all of the significant terminal manufacturers and software houses now support the standard. This means that you can buy (or write) software without worrying about what terminal is going to be used. And it means that you're no longer tied to one terminal source. When a better terminal comes along, you can upgrade to it without obsoleting any of the software that you've done or are using.

The Ambassador provides all of the relevant ANSI controls (even some that tend to be redundant; what we consider redundant, some software writer might not, so we include them all). We've added several private-use controls, that we feel considerably extend the versatility of the ANSI set. (And we've been careful to make them useful, but not necessary. The Ambassador remains a powerful terminal, even if only pure ANSI is used.)

It provides all of the relevant ANSI modes, and a bundle of private-use modes. Some of the added modes are for tailoring the terminal to your individual preferences, some of them are for more versatility, and others are for fine-tuning the standard. (Where a difference of interpretation might result, we've tried to provide a mode to accommodate it.)

## USING THE MANUAL

The manual is divided into 13 sections and an appendix, not all of which will be of interest to every reader. The sections are summarized below to help guide you to the sections of interest. Section 2 is for the person installing the Terminal. Sections 1, 3, 4, and the first couple of pages of 5, should be read by all users. The remaining sections are for the programmer, and the serious user who wishes to take full advantage of the Ambassador's capabilities.

1. **INTRODUCTION.** Contains an overview of the Manual and the Terminal.
2. **CHECKOUT & INSTALLATION.** How to un-pack, install, and checkout the Terminal (and Printer, if applicable)
3. **SETUP MODE.** How to use the SETUP key to locally control the Ambassador's modes.
4. **KEYBOARD.** Describes the Ambassador's Keyboard, and how to use it.
5. **DISPLAY.** Describes the Ambassador's Display, how to write to it, and how to tailor it to your use.
6. **CURSOR CONTROLS.** How to use the Ambassador's controls to move and position the cursor.
7. **EDITING CONTROLS.** How to use the Ambassador's controls to erase and edit the display.



8. SEND CONTROLS. How to use the Ambassador's controls to send data from its display memory to the host.

9. PRINTER. How to set up and use the Printer.

10. FORMS MODE. How to use Forms mode for off-line data entry.

11. PROGRAMMABLE STRINGS. How to program the Ambassador's Programmable keys and other Programmable strings.

12. DIAGNOSTICS. How to initialize the Ambassador, and use its diagnostic features.

13. ANSI STANDARD. A brief review of the ANSI standard as it relates to the Ambassador.

APPENDIX. A summary of all of the Ambassador's controls and modes, arranged by code and by mnemonic, for reference.

#### NOTATIONAL CONVENTIONS

NOTES. The following forms are used to direct the reader's attention to important material.

NOTE: Contains restated or supplementary information.

CAUTION: Contains information necessary to correct operation.

WARNING: Contains information necessary to physical safety.

KEY NOTATIONS. The following notation is used in referring to keys and key sequences:

Keys are referred to by their legend, eg, ESC refers to the ESC key, SETUP to the SETUP key, RESET to the RESET key, etc.

Keys that are to be depressed together are shown with a hyphen between them, eg, CTRL-A means to type the A key with the CTRL key depressed.

Keys that are to be depressed sequentially are shown with a space between them, eg, ESC [ Z means to type the keys ESC, [, and Z in sequence, releasing each before depressing the next.

CODE NOTATIONS. The following notation is used in referring to codes and code sequences:

Single codes are denoted by a character followed by the character code, eg, Z (5/10). The character code notation conforms to the ANSI standard, eg, 5/10 is the same as 5A hex.

A Space-code (2/0) is denoted by the symbol Sp. A New-line code is denoted by the symbol NL.

Single-code controls (control codes) are denoted by the ANSI control mnemonic followed by its code, eg, BS (0/8).

Multiple-code controls (escape and control sequences) are denoted by the ANSI control mnemonic followed by its code sequence, eg, CBT (ESC [ Z). The space between codes is for clarity only, and is not part of the sequence. Long sequences are sometimes shown with segments of the sequence on separate lines (for clarity and ease of annotation); no NL is implied by this separation. Spaces and New-lines are included in sequences only if explicitly represented (by Sp and NL).

Some controls (control sequences) permit the inclusion of decimal parameters:

The notation, Pn, refers to a decimal numeric parameter, eg, CUF (ESC [ Pn C). A value up to decimal 255 (ie, the code sequence 3/2 3/5 3/5) may be included in the control at the Pn position. A parameter value of 0, 1, or omission of the parameter are equivalent, unless otherwise specified in the description of the control, eg, the code sequences ESC [ 0 C, ESC [ 1 C, and ESC [ C, all move the cursor one column forward.

The notation, Ps, refers to a decimal selective parameter, eg, EL (ESC [ Ps K). A selective parameter selects from a list of functions defined in the description of the control. The values are passed in decimal, but valid values are limited to the defined list. A parameter value of 0, or omission of the parameter, refer to the first function in the list, unless otherwise specified in the description of the control, eg, the code sequences ESC [ 0 K and ESC [ K both erase from cursor to end of line.

The notation, Pn..Pn or Ps..Ps, refers to multiple parameters. When multiple parameters are passed, they must be separated by a ; (3/11). In the case of numeric parameters, their position in the sequence is important. Therefore, they are usually shown written out, eg, CUP (ESC [ Pn1 ; Pn2 H). (In this instance, the value of Pn1 specifies the Line number, and the value of Pn2 the Column number.) In the case of selective parameters, their position in the sequence is not important. Therefore, they are usually not written out, eg, SGR (ESC [ Ps..Ps m). As many functions may be selected from the list as desired, and in any order, eg, the code sequences ESC [ 1 ; 5 ; 7 m, ESC [ 7 ; 1 ; 5 m, and ESC [ 5 ; 7 ; 1 m, all result in subsequent characters being written with a bold, blinking, reversed rendition.

Modes are denoted by the ANSI mode mnemonic followed by its Setup location and mode number, eg, LNM (D,20) means that the mode LNM can be found on Setup line D, and its mode number (for use with the Set/Reset Mode controls) is 20. A dash (-) indicates that the mode is not provided on a Setup line.

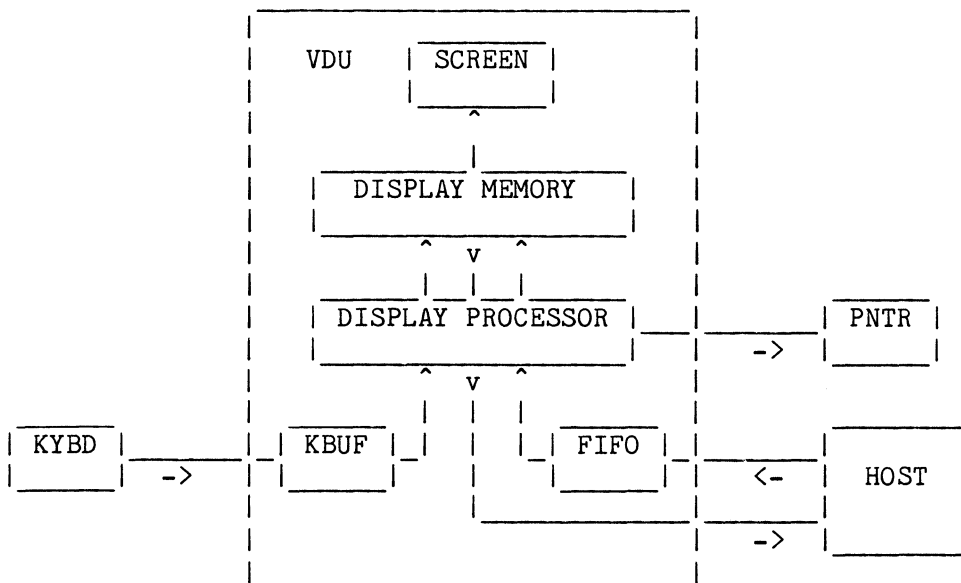
A lower-case 'z' preceding any mnemonic means that the control (or mode) is 'private-use', ie, its function was not provided for in the ANSI standard. For example, zKCM (A,26) is a private-use mode that has been added to the Ambassador to permit key click to be turned on and off.

NOTE: The ANSI standard anticipated such additions, and reserved code space for them. However, it is likely that the functions, and their codes, will differ among the various

manufacturers. It is also likely that many of these functions will be incorporated into later revisions of the standard, and assigned different codes (in the code space reserved for future standardization). Ann Arbor intends to support future revisions of the standard, adding newly-assigned standard codes, and maintaining existing private-use codes, wherever possible.

SYSTEM OVERVIEW.

A simplified block diagram of the Terminal system is shown below. The Terminal consists of a Keyboard (KYBD) and a Visual Display Unit (VDU). The Terminal communicates with a Computer (HOST), and may have a Printer (PNTR) attached.



The Keyboard is used to enter data. The entries are buffered in a Keystroke Buffer (KBUF) in the VDU, and go either to the Display Processor (in Monitor SRM, see below) or to the Host (in Simultaneous SRM). Data sent, or echoed back, by the Host are buffered in a received-data FIFO (first-in, first-out buffer), and go to the Display Processor. The Display Processor acts on the data according to the codes it receives. Displayable character codes are passed on to the Display Memory (and, typically, displayed on the Screen), and/or to the Printer. Control codes (and code sequences) are acted upon, and perform their specified function according to the present settings of the Terminal's modes.

SRM SEND-RECEIVE MODE (B,12). This is a basic mode of the Terminal, as it determines the method of communication to be used with the host.

In the set state, the Terminal is said to be in Simultaneous SRM (aka conversational mode, on-line entry, etc). Most users will use the Terminal in this mode. In Simultaneous SRM, the Keyboard is logically disconnected from the VDU. Keyboard inputs are sent to the Host as they are

keyed. (In the diagram above, the output of the Keystroke Buffer goes directly to the Host. The Display Processor does nothing with the data (except to pass it on.) The host will typically echo the inputs back to the VDU, whereupon they are buffered through the FIFO, acted upon by the Display Processor, and displayed (if graphic characters) or executed (if controls).

In the reset state, the Terminal is said to be in Monitor SRM (aka block mode, off-line entry, etc). In Monitor SRM, the keyboard inputs are not sent to the host as they are keyed. They are, instead, displayed and executed locally, and the resultant display subsequently sent to the host as a block. (In the diagram above, the keyboard inputs are acted upon by the Display Processor directly. The FIFO is not used by the operator; it may be used by the Host to buffer data to the Printer and/or to Display Memory.)

There are two other communication 'modes' in which the Terminal may be used.

zHDM HALF DUPLEX MODE (B,40). Permits the outgoing data to be sent to the Host and wrapped back locally into the Terminal's FIFO. This mode may be used with hosts that cannot support echoback. If used with echoback, double-writing of characters results.

LOCAL TEST MODE. Permits the outgoing data to be wrapped back locally into the Terminal's FIFO, and not sent to the Host. The two-key sequence, SETUP T, puts the Terminal into Local Test; the two-key sequence, SETUP SETUP, returns it to normal operation; see Diagnostics section. During Local Test, the Host is unable to write to the terminal.

If the Host supports an Xon/Xoff protocol, the Terminal's FIFO can be made to 'handshake' with the Host by setting Auto Xon/Xoff Mode.

zAXM AUTO XON/XOFF MODE (B,37). Permits the Terminal to send Xon/Xoff codes to the Host to regulate the flow of received data. During Terminal operation, the FIFO is being filled by the Host, and emptied by the Display Processor. If the Display Processor falls behind, because of a series of slow controls or because the operator has used the PAUSE key to suspend processing, the FIFO gradually fills. When the FIFO is 'almost full', an Xoff code is sent to the Host to suspend further transmission. When the Display Processor catches up, and the FIFO becomes 'almost empty', an Xon code is sent to the Host to resume transmission. The Xon and Xoff codes used by the Host are typically the control codes DC1 (1/1) and DC3 (1/3), respectively. However, they can be set to any ASCII code required by, or convenient to, the Host by changing their values at the end of Setup line B; see Setup Mode section.

If the Host does not support an Xon/Xoff protocol, the data coming from the Host may need to be 'padded', ie, pad characters inserted for time delay. The Ambassador does not normally provide a pad character (so that the full ASCII code set may be passed to the Printer). However, the NUL (0/0) code can be used as a pad character, if required, by setting Ignore NUL Mode.

zINM IGNORE NUL MODE (B,54). Permits the NUL code (0/0) to be used as a pad character, by detecting it at the input to the FIFO and stripping it from the incoming data.

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## UNPACKING

Inspect the shipping carton for signs of damage before opening. If there is any evidence of damage, notify the carrier and Ann Arbor.

Remove the terminal from the shipping carton. The following items should be enclosed:

- Video display unit (VDU)
- Keyboard with attached cable
- Computer cable
- Printer cable
- User's guide

NOTE: The D-Case Keyboard is shipped in a separate carton.

Inspect the contents for damage. If damage is found, notify the carrier and Ann Arbor.

You may wish to save the shipping carton to facilitate return of the equipment for Factory Service should that become required.

## INITIAL TURN-ON

Remove the rear-access door from the VDU. It is attached by a slot-head screw at the base of the door.

For the E-Case, connect the Keyboard cable plug to the black connector closest to the door. The connector is keyed; it plugs in with the cable issuing out the door. It inserts easily; don't force it. Once inserted, press in lightly at top and bottom to be sure that it's well seated. For the D-Case, this connector is extended to the front underside of the VDU. Raise the front of the unit slightly and plug in the keyboard there.

CAUTION: If you have occasion to un-plug this cable, please use the pull-tab provided. Pulling on the cable can damage the cable's interconnect at the plug.

Plug the line cord into a standard three-pin 115VAC wall socket. If not possible, use a two-pin socket with proper ground wire attached and connected to ground.

Turn on power. The E-Case power switch is at the left front of the VDU below the screen. Push to turn on. The D-Case power switch is at the right rear of the VDU below the door. Slide to your left to turn on. You'll hear a short audio tone as the unit turns on.

Allow the tube to warm up. During this time, the terminal is performing its internal self-diagnostic tests. If it finds no errors, the cursor will appear in the upper-left corner of the screen. If it finds an error, and is able, it will display an appropriate error message on the screen. If not able, it will cause the audio to "chirp". See Diagnostics section for an explanation of the errors and possible courses of action.

You may wish to adjust the brightness of the characters. The contrast control on the E-Case is located on the front panel below the screen. On the D-case, it is located on the rear panel below the door. It is recommended that the brightness be set at the minimum comfortable level to prolong the life of the tube and to minimize phosphor burn.

NOTE: Notice that the cursor is brighter than the characters. It is displayed with the 'bold' graphic rendition. You may adjust the differential between the 'normal' and 'bold' renditions with a trimpot located on the logic board near the keyboard connector.

#### INITIAL CHECKOUT

Depress the SETUP key on the keyboard. This will bring Setup line A to the bottom of the screen. Turn to the Setup Mode section, and review how to step through, change, and save the contents of these lines.

Suggested settings for initial checkout are shown below:

```
A 1111 1111 0000 0000
B 9600 0100 1000 0000 0000 0000 0000 17 19
C 0 0 0 0 1200 0100 1100
D 0111 1000 0000 0010 1 0
```

After setting up the lines as shown (or as you want them), 'Save' them as explained in the Setup Mode section. This will ensure that the terminal powers up with the settings you've chosen.

Now, go back into Setup mode (by typing the SETUP key) and exit to Local Test (by typing the letter T). The terminal is now in Local. As you type keys on the keyboard, the generated character codes are passed to the terminal's communications interface but, instead of being passed on to the terminal's outgoing data line, are instead wrapped back into its data input. You are in effect simulating the host from the keyboard.

Observe the Monitor line at the bottom of the screen. This line displays the character codes as they are processed by the terminal; see Diagnostics section. As you type keys on the keyboard, you can observe what codes are being entered and processed.

Take a few minutes to get familiar with this line. It can save you time in installation, and can be a valuable tool in your use of the terminal. Try a few character keys. Note that they are displayed on the Monitor line as well as being written to the screen. Try a cursor key. The ANSI code sequence generated by the key is displayed in the Monitor line and the cursor moves on the screen. Try some other control keys and see what's generated. Try typing in some control sequences, and observe their effect. Examples:

ESC [ 10 C	-Moves the cursor right 10 columns
ESC [ 10 ; 10 H	-Moves the cursor to line 10, column 10
ESC [ 1 K	-Erases from beginning of line to cursor
ESC [ 10 @	-Inserts 10 spaces
ESC [ 10 P	-Deletes 10 characters

At this point you can skip to INSTALLATION if you wish to continue on-line. If you wish to continue off-line, try programming some of the PF (Programmed Function) keys; see Programmable Strings section. Any control sequence, that can be typed in, can be loaded into a Programmable key and, thereafter, executed with a single keystroke.

By using the Setup lines to change terminal modes, and the programmable keys to facilitate entry of terminal controls, you can explore their interaction to whatever extent you wish before involving the host.

## INSTALLATION

NOTE: The following describes installation of the terminal to RS232 Data Communications Equipment. Ann Arbor provides accessory cables to mate with other interfaces. If one of these is ordered, installation instructions are included with the accessory cable.

Install the Computer cable through the rear access door. The small connector plugs into the bottom connector on the daughter board. (The upper connector is for the Printer cable.) The key (long centered rib) faces the main board. The connector snaps in easily; don't force it.

The other end of the cable is a standard RS232 DTE interface:

PIN	SIGNAL
2	Transmit Data
3	Receive Data
4	Request to Send
5	Clear to Send
7	Signal Ground
20	Data Terminal Ready

NOTE: The Clear to Send input to the terminal may be used (to enable/disable transmission from the terminal) or left open (= 'on' condition).

Connect the RS232 connector to the host or the data communications equipment.

Bring Setup line B to the screen. Set the Baud Rate, Parity, and number of Stop Bits, and exit by typing the letter M.

NOTE: Exiting Setup mode with the letter M, returns the terminal to normal (ie, on-line) operation, with the Monitor line displayed at the bottom of the screen, permitting the codes echoed from the host to be observed; see Diagnostics section.

Try operating with the host. The Monitor line displays the codes being actually received from the host. If garbage is being received, check your Baud

Rate, or check (or try a different) Parity or Stop Bit setting.

If nothing is being received, make certain (1) you're not in Setup mode, (2) the SRM (Send Receive) setting in Line B is 1, and (3) the KAM (Keyboard Action) setting in Line B is 0.

If you're still receiving nothing, disconnect the Computer cable at the RS232 interface, short pins 2 and 3 together (which wraps the terminal's outgoing data line back into its incoming data line), and observe on the Data Monitor whether the terminal is actually sending your key entries and sending them correctly. This isolates the problem to the terminal or the external equipment.

If you've changed any of your Setup settings in the process of going on-line with the host, you'll want to 'Save' them before proceeding. Check each of the Setup lines against the diagrams given previously to make sure you've changed only settings you're familiar with. Remember that when you 'Save' the settings you save all four lines at their present state.

When you've completed the installation (including the printer, as described below, if applicable), replace the door. The I/O cables are best brought out at the base of the door; the keyboard cable through either side. The door clamps the cables in place.

## PRINTER INSTALLATION

NOTE: The following describes installation of an RS232-compatible printer to the terminal. The Ambassador supports such printers whether they use RS232 signals, or DC1/DC3 codes, for ready/busy control; see Printer section. Ann Arbor provides accessory cables to mate with other interfaces. If one of these is ordered, installation instructions are included with the accessory cable.

Install the Printer cable through the rear access door. The small connector plugs into the upper connector on the daughter board. The key (long centered rib) faces the main board. The connector snaps in easily; don't force it.

The other end of the cable is a standard RS232 DCE interface:

Pin 2. Transmit Data. Data output from the printer. The terminal recognizes DC3 as a command to disable or suspend printing, and DC1 to enable or resume printing. It ignores all other codes.

Pin 3. Receive Data. Data input to the printer.

Pin 6. Data Set Ready. Control input to the printer. The terminal holds this line in the 'on' condition.

Pin 8. Carrier Detect. Control input to the printer. The terminal holds this line in the 'on' condition.

Pin 7. Signal Ground

Pin 20. Data Terminal Ready. Control output from the printer. An 'off'



(ie, -V) condition on this pin causes the terminal to disable or suspend printing. An 'on' (ie, +V) condition causes it to enable or resume printing. The terminal recognizes no connection at the interface (ie, open) as an 'on' condition.

Connect the RS232 connector to the printer.

Bring Setup line C to the screen, and make the settings required for your printer; see Printer section, Printer Setups.

Exit back on-line (by typing either the SETUP or M key), and try printing. Type the PRINT key to start a Page Print. Type the BREAK key to abort it. If you're using the suggested settings, you're printing from top of screen to cursor (ie, Transfer Termination Mode = 0) so be certain you have the cursor down into the text.

If you're not printing, check the interface requirements in your printer manual. Make sure your printer isn't holding pin 20 low (open is OK), and that it isn't expecting 'on' levels at other than pins 6 and 8. (If it is, you'll have to tie them up to pins 6 or 8, or some other 'on' source.)

If you have a second Ambassador available, try printing to it. (Disconnect the printer and plug the first Ambassador's Printer cable into the second Ambassador's Computer cable.) This permits you observe the printed data codes (on the second Ambassador's Monitor line). Depressing CTRL-S (on the second Ambassador's keyboard), ie, generating DC3, should cause the printing to stop; depressing CTRL-Q, ie, generating DC1, should cause it to resume.

Alternatively, use Remote Copy to type directly to the printer; see Printer section, Using Remote Copy. Go into Local Test (by typing the 2-key sequence, SETUP T). Then go into Remote Copy (by typing the 3-key sequence, ESC [ v). Now characters and control codes entered from the keyboard go directly to the printer. Hold down a key (eg, with a pencil between keys) to generate a repetitive character stream to the printer for debug. (Depressing CTRL-C returns the terminal from Remote Copy. Typing SETUP SETUP returns the terminal from Local Test.)

Use of either of these will help you isolate the problem.

Once you've set up your printer, don't forget to 'Save' the parameters.



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## USING SETUP MODE

The Ambassador's Setup mode is an especially versatile feature. It permits you to review and alter most of the terminal's features and characteristics by bringing functionally-defined Setup lines (A - D) to the screen.

To enter Setup mode, type the SETUP key located above the main keypad. This brings Setup line A to the screen at the bottom of your work area. If there was data there, it's still there; it was just pushed down into memory below the screen. It will return when you leave Setup mode. The cursor is displayed over the letter A. You may use the DOWN-ARROW key on the Control keypad to step through the lines A through D sequentially, and the UP-ARROW key to step back through them.

To change a setting, simply move the cursor to the setting using the RIGHT- and LEFT-ARROW keys on the Control keypad. Note that the setting names automatically display in the right-half of the line. When the cursor is positioned over the desired setting, use the T-SET key to set (or advance) the setting, or the T-CLR key to reset (or decrease) it.

To exit Setup mode, simply type the SETUP key again. The Setup line will disappear and the line it displaced will return to the screen.

## SAVING THE SETUPS

The setting changes made above are temporary. They will be lost when the terminal is turned off (or reset), and will be restored to their power-on values when the terminal is turned back on. If you wish to change their power-on value as well, simply type the letter S (Save), instead of the SETUP key, to exit Setup mode. This saves all of your present Line A-D settings in non-volatile memory.

## OTHER SETUP EXITS

There are other Setup exits that you will find useful. See the Diagnostics section for a more complete description.

Exiting Setup mode by typing the letter M (Monitor) brings a Monitor line to the bottom of the screen. The Monitor line lets you view what you are receiv-

ing from the host (including control codes), in real time, without affecting your display or normal terminal operation. Depressing the SETUP key twice removes the line from the screen.

Exiting Setup mode by typing the letter T (Test) puts the terminal into Local and brings up the Monitor line. Keyboard entries are wrapped back into the terminal, as received data, and are displayed on the Monitor line so that you can see exactly what you are entering. Depressing the SETUP key twice returns the terminal on-line, and removes the line from the screen.

Exiting Setup mode by typing the letter X (Xparent) puts the terminal into Transparent mode. All codes subsequently entered or received are displayed (on the screen) and not acted upon. Typing the SETUP key twice returns the terminal to normal operation.

Exiting Setup mode by typing the letter Y or Z causes the terminal to go into self-test. In either case the tests can be aborted by holding down any key.

#### HOST CONTROL

Most of the settings can also be changed by the host. Notice that some settings have a number displayed in parentheses following their name. The host may control these settings by sending that number as part of an SM/RM (Set/Reset Mode) control sequence. The host may control the page and margin settings of the printer (Line C) with the control zSPF (Set Print Format). The host cannot control the baud rate or parity settings on either the host (Line B) or printer (Line C) ports.

Since the SETUP key is programmable (see Programmable Strings section), the host may disable the key to prevent operator access to the Setup lines.

#### SETUP NOTATION

The contents of the Setup lines are listed on the following pages. Terminal modes are shown with their mnemonic, name, mode number (in parentheses), and a short-form description. A full description of the modes can be found in the Appendix, arranged alphabetically by their mnemonic.

A mode is referred to as 'reset' if its value is zero; 'set' if its value is one. In most cases, the mode name implies the set state, eg, setting Key Click Mode (zKCM) enables key click. For some ANSI modes the opposite is true, eg, resetting Format Effector Transfer Mode (FETM) enables the transfer.

LINE A - USER CONVENIENCE MODES. This line displays a number of terminal modes that are primarily for the convenience of the user.

zBKCM	Block Cursor Mode (31)	0= Underline cursor
zBNCM	Blinking Cursor Mode (32)	0= Steady cursor
zKCM	Key Click Mode (26)	0= No click
zMBM	Margin Bell Mode (25)	0= No bell
zKPCM	Key Pad Control Mode (27)	0= Numeric pad
zRLM	Return Key CRLF Mode (29)	0= No LF
zKRM	Key Repeat Mode (28)	0= No repeat
zFRM	Fast Repeat Mode (47)	0= Slow
zAPM	Auto Pause Mode (38)	0= Manual only
zSSM	Slow Scroll Mode (39)	0= No delay
zHAM	Hold in Area Mode (48)	0= Auto skip
zFIM	Function-key Initialize Mode (50)	0= Null strings
zTPDM	Transfer Pointer Display Mode (41)	0= No display
zCLIM	Caps Lock Invert Mode (53)	0= Uppercase only
	Reserved	
	Reserved	

LINE B - SEND PARAMETERS. This line displays the parameters that tailor the input/output channel to the host computer.

	Baud Rate	110-19200
	Parity	00=Odd 01=Even 10=Space 11=Mark
	Stop Bits	0=1 1=2
	Parity Detection	0=Off 1=On
SRM	Send-Receive Mode (12)	0= Monitor SRM
zHDM	Half-Duplex Mode (40)	0= No local echo
KAM	Keyboard Action Mode (2)	0= Enable keyboard
zAKDM	Auto Keyboard Disable Mode (46)	0= Auto re-enable
TTM	Transfer Termination Mode (16)	0= Stop at cursor
GATM	Guarded Area Transfer Mode (1)	0= Honor guard
SATM	Selected Area Transfer Mode (17)	0= Selected areas only
MATM	Multiple Area Transfer Mode (15)	0= Active area only
FETM	Format Effector Transfer Mode (14)	0= Line separators sent
zFSTM	Field Separator Transfer Mode (44)	0= No page tabs sent
zCSTM	Column Separator Transfer Mode (43)	0= No column tabs sent
zGRTM	Graphic Rendition Transfer Mode (45)	0= No SGR's sent
zAXM	Auto Xon/Xoff Mode (37)	0= Disable
zLTM	Line Transfer Mode (42)	0= No pause at EOL
zMKM	Meta Key Mode (52)	0= Disable
zMMM	Meta Monitor Mode (57)	0= Disable
zINM	Ignore NUL Mode (54)	0= Pass NUL's
	Reserved	
	Reserved	

Reserved

XON Code (0-127)  
 XOFF Code (0-127)

LINE C - PRINT PARAMETERS. This line displays the parameters that tailor the output channel to the printer.

Printed Lines	0-126
Total Lines	0-126
Left Margin	0-254
New-Line Pads	0-254
Baud Rate	110-19200
Parity	00=Odd 01=Even 10=Space 11=Mark
Stop Bits	0=1 1=2
zGAPM Guarded Area Print Mode (49)	0= Print as spaces
New-Line Character	01=LF 10=CR 11=CRLF
Form Feed	0=NLS 1=FF
Reserved	

LINE D - OTHER MODES. This line displays the remaining terminal modes that are not displayed on the previous lines.

zICM Invisible Cursor Mode (56)	0= Display cursor
zWFM Wrap Forward Mode (33)	0= No wrap
zWBM Wrap Backward Mode (34)	0= No wrap
zDBM Destructive Backspace Mode (30)	0= Non-destructive
zDDM DEL-character Display Mode (35)	0= Don't display
zSPM Scroll-Page Mode (36)	0= Scroll
TSM Tabulation Stop Mode (18)	0= Column tabs
ERM Erasure Mode (6)	0= Honor protect
LNM LF New Line Mode (20)	0= No CR
zCNM CR New Line Mode (55)	0= No LF
Reserved	
Reserved	
Reserved	
Reserved	
SEE Select Editing Extent (0=Page 1=Line 2=Field 3=Area)	
Reserved	

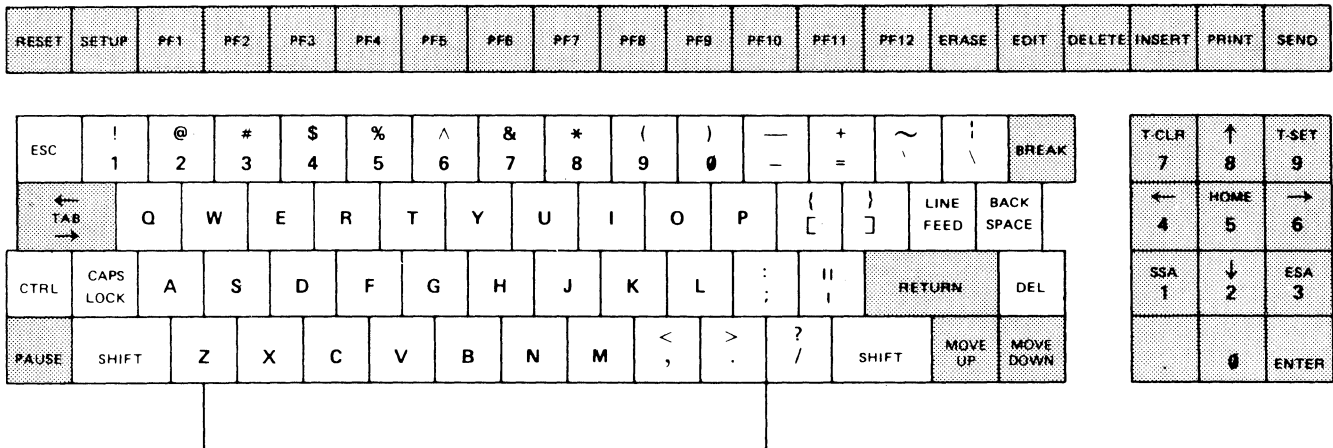
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KEYBOARD LAYOUT

The Ambassador has a typewriter-style keyboard, consisting of a 62-key Main keypad, a 12-key Control pad (to the right), and a 20-key Function pad (above). The operation of these keypads, under the various modes available to the user, is described in this section.



MODES THAT AFFECT THE KEYBOARD

The following modes affect your use of the keyboard. Their settings may be reviewed, and changed as desired, on the Setup lines; see Setup section. The Setup line letter, and mode number, are shown in parentheses following the name. Detailed descriptions of these modes can be found in the Appendix.

zKCM KEY CLICK MODE (A,26). Turns on key click.

zMBM MARGIN BELL MODE (A,25). Turns on margin bell.

zKPCM KEY PAD CONTROL MODE (A,27). Inverts the Control keypad in respect to the SHIFT key.

zRLM RETURN KEY CRLF MODE (A,29). Lets the RETURN key generate CR or CRLF. Note: The modes LNM (LF New Line) and zCNM (CR New Line) determine which code(s) do a new-line action when received by the terminal.

zKRM KEY REPEAT MODE (A,28). Enables the keys to auto-repeat when held down for more than 1/2 second.

zFRM FAST REPEAT MODE (A,47). Selects a faster repeat rate.

zFIM FUNCTION-KEY INITIALIZE MODE (A,50). Loads the PF keys with codes at power-on.

zCLIM CAPS LOCK INVERT MODE (A,54). Enables lower-case entry, with the SHIFT key, when the CAPS LOCK key is down.

KAM KEYBOARD ACTION MODE (B,2). Locks the keyboard (see Controls below).

zMKM META KEY MODE (B,52). Changes the PAUSE key to a META SHIFT key.

zDBM DESTRUCTIVE BACKSPACE MODE (D,30). Lets the BACKSPACE key do a destructive backspace.

#### CONTROLS THAT AFFECT THE KEYBOARD

The keyboard can be locked and unlocked with the controls DMI/EMI. When the keyboard is locked, key entry is inhibited (attempted entries result in an error 'beep') and the cursor is not displayed. If this happens accidentally, go into Setup (the SETUP key is not inhibited) and reset the KAM (Keyboard Action Mode) setting on Line B.

DMI DISABLE MANUAL INPUT (ESC `). Locks the keyboard.

EMI ENABLE MANUAL INPUT (ESC b). Unlocks the keyboard.

#### PROGRAMMABLE KEYS

38 of the Ambassador's keys are user programmable. These are shown shaded on the Keyboard Layout diagram. They may be programmed with frequently used host (or application) commands, for one keystroke execution, or with terminal control strings, to execute special-purpose functions, or with null, to disable keys (like SETUP and RESET) for operator-restricted applications.

Many of the keys are programmable on more than one level (ie, they can be programmed to generate different strings, unshifted and shifted), for a total of 60 programmable key strings. The strings can be programmed with any sequence of ASCII codes, up to a total of 320 codes, with no restrictions on number of codes per key. In addition, each string can be programmed as Local-only (the string is executed locally, regardless of the setting of SRM), as Transmit-only (the string is transmitted to the host, regardless of the setting of SRM), and/or as Repeating (the string is repeated, after a delay, as long as the key is held down).

In addition, the Ambassador provides a programmable non-volatile Power-on string that may be used (among other purposes) to automatically configure the keyboard in a desired way each time the terminal is turned on.

See the Programmable Strings section for details of these capabilities.



MAIN KEYPAD DESCRIPTION

The Main keypad consists of alphabetic keys (single legend), non-alphabetic keys (2 legends), the CTRL key, and several other keys for terminal control. For each group, the code (or control) generated by the keys is tabulated and, for the terminal control keys, a short description is given of the function performed by the key (when its control is received by the terminal). A more complete description of the controls may be found in the Appendix.

ALPHABETIC KEYS. The 26 alphabetic keys generate lower-case codes unless either of the SHIFT keys, or the CAPS LOCK key, are down. With the CAPS LOCK key down, the keys generate upper-case codes, unshifted and shifted. (The keys may be made to generate lower-case codes, shifted, by setting zCLIM.)

=====		=====		=====	
UNSHIFTED	SHIFTED	UNSHIFTED	SHIFTED	UNSHIFTED	SHIFTED
=====		=====		=====	
a (6/1)	A (4/1)	j (6/10)	J (4/10)	s (7/3)	S (5/3)
b (6/2)	B (4/2)	k (6/11)	K (4/11)	t (7/4)	T (5/4)
c (6/3)	C (4/3)	l (6/12)	L (4/12)	u (7/5)	U (5/5)
d (6/4)	D (4/4)	m (6/13)	M (4/13)	v (7/6)	V (5/6)
e (6/5)	E (4/5)	n (6/14)	N (4/14)	w (7/7)	W (5/7)
f (6/6)	F (4/6)	o (6/15)	O (4/15)	x (7/8)	X (5/8)
g (6/7)	G (4/7)	p (7/0)	P (5/0)	y (7/9)	Y (5/9)
h (6/8)	H (4/8)	q (7/1)	Q (5/1)	z (7/10)	Z (5/10)
i (6/9)	I (4/9)	r (7/2)	R (5/2)		

NON-ALPHABETIC KEYS. The non-alphabetic keys generate the lower-legend codes unless either of the SHIFT keys are down. The CAPS LOCK key does not affect the codes generated by these keys. The SPACE BAR generates the code 2/0, both unshifted and shifted.

=====		=====		=====	
UNSHIFTED	SHIFTED	UNSHIFTED	SHIFTED	UNSHIFTED	SHIFTED
=====		=====		=====	
1 (3/1)	! (2/1)	8 (3/8)	* (2/10)	[ (5/11)	{ (7/11)
2 (3/2)	@ (4/0)	9 (3/9)	( (2/8)	] (5/13)	} (7/13)
3 (3/3)	# (2/3)	0 (3/0)	) (2/9)	;	:
4 (3/4)	\$ (2/4)	- (2/13)	_ (5/15)	' (2/7)	" (2/2)
5 (3/5)	% (2/5)	= (3/13)	+ (2/11)	,	< (3/12)
6 (3/6)	^ (5/14)	` (6/0)	~ (7/14)	.	> (3/14)
7 (3/7)	& (2/6)	\ (5/12)	(7/12)	/ (2/15)	? (3/15)

CTRL (CONTROL) KEY. With the CTRL key depressed, the preceding keys generate control codes. (The CTRL key resets the two high-order bits of the normal code.)

CODE	KEY	CODE	KEY	CODE	KEY
NUL (0/0)	CTRL-@	VT (0/11)	CTRL-K	SYN (1/6)	CTRL-V
SOH (0/1)	CTRL-A	FF (0/12)	CTRL-L	ETB (1/7)	CTRL-W
STX (0/2)	CTRL-B	CR (0/13)	CTRL-M	CAN (1/8)	CTRL-X
ETX (0/3)	CTRL-C	SO (0/14)	CTRL-N	EM (1/9)	CTRL-Y
EOT (0/4)	CTRL-D	SI (0/15)	CTRL-O	SUB (1/10)	CTRL-Z
ENQ (0/5)	CTRL-E	DLE (1/0)	CTRL-P	ESC (1/11)	CTRL-[
ACK (0/6)	CTRL-F	DC1 (1/1)	CTRL-Q	FS (1/12)	CTRL-\
BEL (0/7)	CTRL-G	DC2 (1/2)	CTRL-R	GS (1/13)	CTRL-]
BS (0/8)	CTRL-H	DC3 (1/3)	CTRL-S	RS (1/14)	CTRL-^
HT (0/9)	CTRL-I	DC4 (1/4)	CTRL-T	US (1/15)	CTRL-_ _
LF (0/10)	CTRL-J	NAK (1/5)	CTRL-U		

Note: NUL may also be generated by CTRL-Sp (spacebar), RS by CTRL-. (period), and US by CTRL-/ (slash), to avoid use of the SHIFT key.

OTHER KEYS. The remaining keys on the Main keypad generate terminal control functions as tabulated below. Note: \* indicates a programmable string.

KEY	UNSHIFTED	SHIFTED
ESC	ESC (1/11)	CSI (ESC [)
TAB	* HT (0/9)	* CBT (ESC [ Z)
PAUSE	* Local string	* Local string
BREAK	* Short break	* Long break
LINE FEED	LF (0/10)	Same as unshifted
BACKSPACE	BS (0/8)	Same as unshifted
RETURN	* CR (0/13)	Same as unshifted
DEL	DEL (7/15)	Same as unshifted
MOVE UP	* Local string	* Local string
MOVE DOWN	* Local string	* Local string

TAB. Moves the cursor forward to the next tab stop (unshifted), or backward to the last tab stop (shifted).

PAUSE. If zAXM (Auto Xoff/Xon Mode) is set, permits start/stop of displayed data from the host; see Display section, Flow Control of Received Data. If zMKM (Meta Key Mode) is set, acts as a Meta shift key; see zMKM.

BREAK. Forces the outgoing data line to its Space level for about 1/4 second (unshifted) or 3-1/2 seconds (shifted).

LINE FEED. Moves the cursor to the same column in the next line, or to the beginning of the next line, depending on the setting of LNM (LF New Line Mode).

BACKSPACE. Moves the cursor left one. If zDBM (Destructive Backspace

Mode) is set, it also erases the character at that position.

RETURN. Moves the cursor to the beginning of the active line, or to the beginning of the next line, depending on the setting of zCNM (CR New Line Mode). If zRLM (Return Key CRLF Mode) is set, the key generates CRLF (instead of just CR).

DEL. The DEL character is ignored, or displayed, depending on the setting of zDDM (DEL-character Display Mode).

MOVE UP & MOVE DOWN. If the operator's window is smaller than the page size set by the host (see Display section), these keys permit viewing the full page by moving the window up or down a line at a time (unshifted) or in full-screen steps (shifted). If CTRL is depressed, the screen 'Zoom' feature is activated. The MOVE UP key moves additional data lines onto the screen. The MOVE DOWN key moves them off, spreading out the display.

#### CONTROL KEYPAD

The Control pad consists of a block of 12 keys located to the right of the Main keypad. If zKCPM is reset, it provides for numeric data entry (unshifted) and terminal control functions (shifted). If zKCPM is set, it provides for terminal control functions (unshifted) and numeric data entry (shifted). The table below assumes zKCPM reset. Note: \* indicates a programmable string.

=====	=====	=====
KEY	UNSHIFTED	SHIFTED
=====	=====	=====
HOME/5	5 (3/5)	* CUP (ESC [ H)
UP-ARROW/8	8 (3/8)	* CUU (ESC [ A)
DN-ARROW/2	2 (3/2)	* CUB (ESC [ B)
RT-ARROW/6	6 (3/6)	* CUF (ESC [ C)
LT-ARROW/4	4 (3/4)	* CUD (ESC [ D)
T-SET/9	9 (3/9)	* HTS (ESC H)
T-CLR/7	7 (3/7)	* TBC (ESC [ g)
SSA/1	1 (3/1)	* SSA (ESC F)
ESA/3	3 (3/3)	* ESA (ESC G)
0	* 0 (3/0)	None
ENTER	* CR (0/13)	Same as unshifted

HOME. Moves the cursor to the beginning of the page.

UP-ARROW. Moves the cursor up one line.

DN-ARROW. Moves the cursor down one line.

RT-ARROW. Moves the cursor right one column.

LT-ARROW. Moves the cursor left one column.

T-SET. Sets a tab stop at the cursor position.

T-CLR. Clears a tab stop at the cursor position.  
With CTRL depressed, clears all tabs.

SSA. Writes a start-of-selected-area symbol to the screen.

ESA. Writes an end-of-selected-area symbol to the screen.

ENTER. Acts the same as the Return key on the Main keypad.

#### FUNCTION KEYPAD

The Function keypad consists of a row of 20 keys located above the Main keypad. Note: \* indicates a programmable string.

=====	=====	=====
KEY	UNSHIFTED	SHIFTED
=====	=====	=====
RESET	* RIS (ESC c)	Same as unshifted
SETUP	* Local string	Same as unshifted
PF1	* SS3 (ESC O A)	* SS3 (ESC O M)
PF2	* SS3 (ESC O B)	* SS3 (ESC O N)
PF3	* SS3 (ESC O C)	* SS3 (ESC O O)
PF4	* SS3 (ESC O D)	* SS3 (ESC O P)
PF5	* SS3 (ESC O E)	* SS3 (ESC O Q)
PF6	* SS3 (ESC O F)	* SS3 (ESC O R)
PF7	* SS3 (ESC O G)	* SS3 (ESC O S)
PF8	* SS3 (ESC O H)	* SS3 (ESC O T)
PF9	* SS3 (ESC O I)	* SS3 (ESC O U)
PF10	* SS3 (ESC O J)	* SS3 (ESC O V)
PF11	* SS3 (ESC O K)	* SS3 (ESC O W)
PF12	* SS3 (ESC O L)	* SS3 (ESC O X)
ERASE	* EL (ESC [ K)	* ED (ESC [ J)
EDIT	* zTI (ESC 6)	Same as unshifted
DELETE	* DCH (ESC [ P)	* DL (ESC [ M)
INSERT	* ICH (ESC [ @)	* IL (ESC [ L)
PRINT	* MC (ESC [ i)	* Local string
SEND	* None	Same as unshifted

RESET. Resets the terminal to its power-on state.

SETUP. Puts the terminal into Setup mode, permitting review or alteration of the terminal's characteristics.

PF1-12. No action. These codes may have special meaning to the host. If zFIM (Function-key Initialize Mode) is reset, the keys will initialize to null (ie, no codes).

ERASE. Erases from cursor to end of line (unshifted), or to end of page (shifted).

EDIT. Toggles the terminal into and out of Edit mode. Characters typed during Edit mode are inserted at the cursor position and push following characters to the right instead of overwriting them.

DELETE. Deletes the character at the cursor position and moves the following characters left to fill the space. With SHIFT depressed, deletes the entire line containing the cursor and moves the following lines up.

INSERT. Moves the character at the cursor position to the right, opening a space. With SHIFT depressed, moves the entire line containing the cursor down, opening an empty line.

PRINT. Transmits the displayed data to a local printer. With SHIFT depressed, toggles the printer into and out of copying the received data stream.

SEND. Transmits the displayed data to the host computer (Monitor SRM only). Note: The SEND key has two programmable strings, one active during Simultaneous SRM (initialized to null), the other active during Monitor SRM (initialized to the control STS, Set Transmit State).



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## DISPLAY FEATURES

The Ambassador has a large 15-inch non-glare screen that can display up to 60 lines of information. A versatile array of modes and controls permits the user to tailor the display for maximum convenience, efficiency, and individual comfort. The use of these modes and controls is described and illustrated in this section.

### MODES THAT AFFECT THE DISPLAY

The following modes affect your use of the display. Their settings can be reviewed, and changed as desired, on the Setup lines; see Setup section. The Setup line letter, and mode number, are shown in parentheses following the name. Detailed descriptions of these modes can be found in the Appendix.

zBKCM BLOCK CURSOR MODE (A,31). Selects an underline or block cursor symbol.

zBNCM BLINKING CURSOR MODE (A,32). Causes the cursor symbol to blink.

zAPM AUTO PAUSE MODE (A,38). Permits the operator to regulate the flow of data onto the Screen with the PAUSE key (if the host supports an Xon/Xoff protocol; see zAXM).

zSSM SLOW SCROLL MODE (A,39). Regulates the flow of data onto the Screen to a fixed rate of about 4 lines/second (if the host supports an Xon/Xoff protocol).

zAXM AUTO XON/XOFF MODE (B,37). Permits start/stop codes to be sent to the host to regulate the flow of data to the terminal.

zICM INVISIBLE CURSOR MODE (D,56). Inhibits display of the cursor symbol. Useful when using programs that generate their own cursor (such as spread-sheets).

zWFM WRAP FORWARD MODE (D,33). Permits the cursor to wrap forward at end of line (to the beginning of the next line).

zDDM DEL-CHARACTER DISPLAY MODE (D,35). Permits display of the DEL-character (for systems that don't use DEL as a pad, or time-out, character).

zSPM SCROLL-PAGE MODE (D,36). Inhibits additional data entry at end of Page.

LNM LF NEW LINE MODE (D,20). Selects CTRL-J (LF) as the new-line code (instead of CRLF).

zCNM CR NEW LINE MODE (D,55). Selects CTRL-M (CR) as the new-line code (instead of CRLF).

zACM ALTERNATE CURSOR MODE (-,51). Enables an alternate (aka blind) cursor. The alternate cursor may write anywhere in Display Memory, whereas the primary cursor is limited to the (working) Page.

#### CONTROLS THAT AFFECT THE DISPLAY

The following controls affect the display. The code sequence (that executes them) is shown in parentheses following the name. The code sequence may be generated by the host, typed from the keyboard, or programmed into a function key; see Programmable Strings section. Detailed descriptions of these controls can be found in the Appendix.

zTFC TOGGLE FAST-BLINK CURSOR (ESC 5). Toggles the cursor symbol between its 'normal' display (as selected by zBKCM and zBKNM) and a fast-blinking block, for operator attention or warning.

zSDP SET DISPLAY PARAMETERS (ESC [ Pn..Pn p). Partitions both the Display Memory and Screen according to the parameters, Pn; see Display Definitions below. This control encompasses functions variously known as line lock, memory lock, split screen, etc.

SD SCROLL DOWN (ESC [ Pn T). Moves the displayed text down (or the Window up) the number of lines specified by Pn (if Window is smaller than Page; see Display Definitions below).

SU SCROLL UP (ESC [ Pn S). Moves the displayed text up (or the Window down) the number of lines specified by Pn (if Window is smaller than Page).

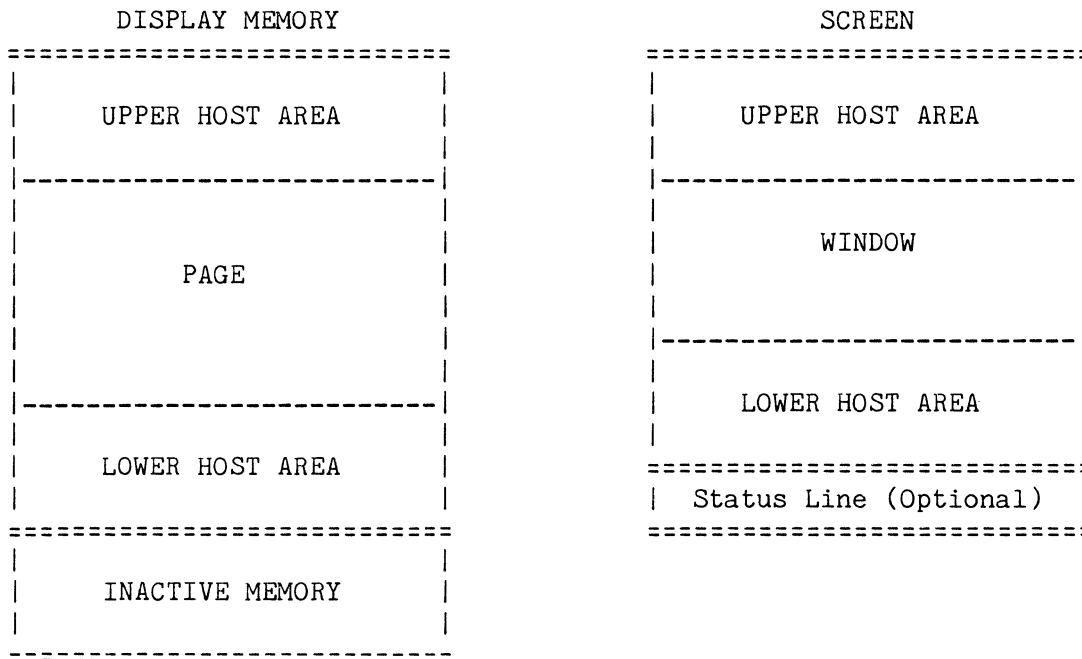
SGR SET GRAPHIC RENDITION (ESC [ Ps..Ps m). Selects the graphic rendition (aka highlights, visual attributes, etc.) with which all following characters received will be displayed; see Highlighting the Display, below.

zCGR CHANGE GRAPHIC RENDITION (ESC 9). Changes the graphic rendition of all following characters in the Page to that selected by the last SGR control. (If the terminal is in Forms mode, this control affects only the active area; see Forms section.)



DISPLAY DEFINITIONS

Certain terms are used in describing the Ambassador's display features. They are shown in the diagrams below, and defined following, to clarify their usage.



**DISPLAY MEMORY:** That portion of memory that is available to hold the results of keyboard and data transfer operations. The size of the Ambassador's Display Memory is 60 lines x 80 characters. It contains the following segments (starting from Display Memory address line 1): Upper Host Area, Page, Lower Host Area, and Inactive Memory.

**ACTIVE MEMORY:** That portion of Display Memory that is assigned to hold the results of subsequent keyboard and data transfer operations. It may be set to any size from 18 to 60 lines, inclusive, with the zSDP control (1st parameter). It is initialized to 60 lines at power-on.

**INACTIVE MEMORY:** The remaining (ie, unassigned) portion of Display Memory.

**NOTE:** The zSDP control does not affect the contents of Display Memory; only the partitioning. Any data that was partitioned into Inactive Memory by a zSDP control can be retrieved by another zSDP control partitioning it into Active Memory.

**UPPER HOST AREA:** The upper-most portion of Active Memory, declared to be outside of the operator's working Page. Its size may be set with the zSDP control (2nd parameter). It is initialized to 0 lines at power-on.

**LOWER HOST AREA:** The lower-most portion of Active Memory, declared to be outside of the operator's working Page. Its size may be set with the zSDP control (3rd parameter). It is initialized to 0 lines at power-on.

**PAGE:** The portion of Active Memory between the Upper and Lower Host Areas. The minimum Page size is one line. (A zSDP control that attempts to leave a Page of less than a 1 line is ignored.)

**NOTE:** The Page is the only portion of Display Memory that can be accessed, written, or affected (by erase/edit operations) with the primary cursor; see zACM (Alternate Cursor Mode).

**SCREEN:** The visible portion of Active Memory (ie, what's seen on the CRT). It may be set to any of the following sizes with the zSDP control (4th parameter) -- 18, 20, 22, 24, 26, 28, 30, 36, 40, 48, or 60 lines. It is initialized to 30 lines at power-on. It contains the following segments (starting from the top of the CRT): Upper Host Area, Window, Lower Host Area, and an optional Status Line.

**WINDOW:** The portion of the Screen between the Upper and Lower Host Areas. (The Host Areas, and optional Status Line, are displayed in their entirety; what's left over is called the Window). The minimum Window size is 1 line. (A zSDP control that attempts to leave less than 1 line for the Window defaults to the smallest Screen size that permits it.)

**NOTE:** The Window is the only portion of the Screen that is affected by scroll and zoom operations.

**STATUS LINE:** A line may be brought up to the bottom of the Screen to display terminal setups or to monitor received data; see Setup section. The content of this line is not stored in Display Memory (ie, it does not use up one of the 60 lines). When the line is brought up, it displaces one line from the Window. When the line is removed, the displaced line returns to the Window.

**NOTE:** The zSDP control specifies the four parameters Active Memory, Upper Host Area, Lower Host Area, and Screen size. The sum of the Host Areas should be smaller than Active Memory and at least 2 lines smaller than Screen.

## WRITING THE DISPLAY

The cursor marks the active position in the Page, ie, the position at which the next character received will be displayed. The address space (for cursor positioning) is relative to the Page. Line 1 is always the top line of the Page. Line 1, column 1 (address 1,1) is the upper left corner of the Page (corresponding to cursor at Home). Address 1,80 is the upper right corner of the Page. Address N,80 is the last character position in the Page (where N is the number of lines set for the Page size).

The cursor is automatically positioned to Home at power-on (with the Display Memory erased), and by any zSDP control (with the Display Memory unchanged).

As each character is received, it is displayed, and the cursor moves to the next column on the line. A new-line control terminates the line and moves the cursor to the 1st column of the next line. New-line controls are NEL, and CRLF (if LNM and zCNM are reset) or CR (zCNM set) or LF (LNM set). If no new-line control is received, the cursor wraps from the 80th column to the 1st column of the next line (zWFM set), or remains in the 80th column and is

overwritten by subsequent characters (zWFM reset).

If the Window is smaller than the Page, when the cursor reaches the bottom line of the Window, a new-line control (or cursor wrap) moves the Window down one line to retain the cursor in the Window.

When the cursor reaches the bottom line of the Page, a new-line control (or cursor wrap) moves all lines in the Page up one line. The (former) content of the top line of the Page is lost. The bottom line of the Page is erased, and the cursor positioned in its 1st column. (Note: If zSPM is set, the terminal is said to be in Page mode, and this 'memory scroll' action is inhibited.)

Thereafter (unless the cursor is re-positioned), all new lines received are written into the bottom line of the Page, the older lines scrolling upward in the Page, the oldest lines being lost off the top of the Page.

This action is viewed through the Window, which is displaying the bottom-most segment of the Page. The full Page can be 'zoomed' into the Window at any time, without interrupting the data flow; see Zooming the Display. The data flow can be suspended at any time; see Flow Control of Received Data. When the data flow is suspended, the Page can be viewed by moving the Window (either with or without moving the cursor); see Moving the Window.

#### FLOW CONTROL OF RECEIVED DATA

If the host supports an Xon/Xoff protocol (see zAXM), the Ambassador provides a powerful flow control capability that permits the operator to regulate the rate of display of incoming data. This includes an ability to start and stop the data flow (with the PAUSE key), to step the data onto the screen a line (or several lines) at a time (zAPM, Auto Pause Mode), and to regulate the display to a fixed line rate (zSSM, Slow Scroll Mode),

**PAUSE KEY.** Incoming data is normally displayed as fast as it is received. At higher baud rates, especially with short lines, the data may pass through the window much too rapidly to be viewed. When this happens, simply hit the PAUSE key, to 'freeze' the display. If you missed something, zoom (or scroll) up to see it. Hit the PAUSE key again, and the display continues.

**AUTO PAUSE.** The normal PAUSE key operation is useful for scanning a file, or getting quickly to a part you want, but to read the file, go into Auto Pause Mode. Hit CTRL-PAUSE (instead of just PAUSE). Again the display freezes but, this time, hitting the PAUSE key just steps the next line onto the screen. Type PAUSE again, and the next line appears. You can step through the data, a line at a time, by repeatedly typing the PAUSE key. (Note: The PAUSE key can be programmed to repeat; see Programmable Strings section. This is useful in Auto Pause Mode, but can be confusing in the normal operation of the PAUSE key.)

Alternatively, you can step through the file a window at a time by hitting SHIFT-PAUSE. This lets in (two lines less than) a window-full of new data. (The bottom lines of the previous window are retained as the top lines of the new window for context, and assurance that nothing was missed.) When you've finished reading what you wished, hit CTRL-SHIFT-PAUSE which resets Auto Pause Mode, and returns you to normal PAUSE key operation.

CTRL-PAUSE. Turns on Auto Pause.  
PAUSE. Admits a new line of data to the screen.  
SHIFT-PAUSE. Admits a new window of data to the screen.  
CTRL-SHIFT-PAUSE. Turns off Auto Pause.

SLOW SCROLL. Before initiating display of the file, or any time you're Paused, you can set Slow Scroll Mode (Setup line A). This regulates the display of incoming data to a fixed line rate (of about 4 lines/second). This is particularly useful if the file consists mostly of short lines.

SETUP KEY. The SETUP key also suspends the incoming data flow, to let you change settings in the middle of a listing (eg, to set and reset Slow Scroll Mode). Typing SETUP again (the normal Setup exit) re-starts it. Exiting with the letter M (Monitor), re-starts it with a Data Monitor line at the bottom of the screen (that permits viewing the actual codes, including control codes, being received; see Diagnostics section).

#### ZOOMING THE DISPLAY

The Ambassador's unique 'ZOOM' capability permits either the operator or the host to control the number of lines actually displayed in the Window (up to the full Page).

OPERATOR CONTROL: The operator controls the Window with the MOVE UP and MOVE DOWN keys. CTRL- MOVE UP adds lines into the Window. CTRL- MOVE DOWN removes lines from the Window. As lines are removed, both the interline spacing and the character size increase. The operator may adjust the Screen for individual comfort and ease of viewing, yet 'zoom' the full Page onto the Screen for overall context when desired. These actions are transparent to the host; they do not affect the transfer of data or Display Memory addresses.

HOST CONTROL: The host controls the Window size with the zSDP control. The 4th parameter specifies Screen size (Window size being Screen size less any Host areas). The 4th parameter may be omitted if it is desired to re-partition Display Memory without changing the Screen size. Similarly, omitting the 1st parameter, permits the Screen size to be changed (ie, 'zoomed') without affecting the Display Memory partitions. Examples:

```
ESC [ 60 ; ; ; 30 p
```

Partitions Display Memory for a 60-line Page, with 0 lines of Inactive Memory. The Screen (and Window) displays 30 lines.

```
ESC [ 60 ; ; p
```

Partitions Display Memory as above, but leaves the Screen size unchanged.

```
ESC [ ; ; ; 60 p
```

Changes the Screen size to 60 lines, but leaves the Display Memory partitions unchanged.

## MOVING THE WINDOW (w/ CURSOR)

If the Window is set to be smaller than the Page, the Window moves naturally with the cursor. Any attempt, by the operator or the host, to move the cursor outside of the Window causes the Window to move up or down within the Page so as to retain the cursor symbol within the Window.

NOTE: The host may write outside of the Window, whenever desired, by using the alternate cursor. The Window position is not affected by alternate cursor movements; see ZACM.

OPERATOR CONTROL: The operator will normally move the Window with the HOME and cursor ARROW keys (on the Control keypad). The cursor keys are non-destructive; no data can be lost through their use.

HOST CONTROL: The host will normally position the Window with the CUP (Cursor Position) control. Examples:

ESC [ H ESC [ Pn H                    Pn >= Window size

This string positions the Window such that the line specified by the parameter, Pn, is displayed in the bottom line of the Window. Note: The Window may not be positioned above the top line of the Page.

ESC [ 99 H ESC [ Pn H                    Pn <= Page size - Window size +1

This string positions the Window such that the line specified by the parameter, Pn, is displayed in the top line of the Window. Note: The Window may not be positioned below the bottom line of the Page.

## MOVING THE WINDOW (w/o CURSOR)

The Window may also be moved without moving the cursor, ie, without changing its position within the Page. However, if the Window is moved so that it no longer contains the cursor symbol, any attempt at entry by the operator, or cursor positioning by the host, will automatically re-position the Window to contain the cursor symbol.

OPERATOR CONTROL: The operator may use the MOVE UP and MOVE DOWN keys to locally move the window. MOVE UP moves the Window up (toward beginning of Page). MOVE DOWN moves the Window down (toward end of Page). SHIFT- MOVE UP moves the Window up several lines (2 lines less than a full window). SHIFT- MOVE DOWN moves the Window down several lines.

HOST CONTROL: The host may use the controls SU (Scroll Up) and SD (Scroll Down) to move the Window. Scroll up moves the text up (corresponding to moving the Window down). Scroll down moves the text down (corresponding to moving the Window up). In both cases, the text moves by the number of lines specified by the parameter. If there are not that many lines remaining to the top (or bottom) of page, the Window moves to the top (or bottom) of Page and stops.

## USING THE HOST AREAS

The Ambassador's Host Area capability permits one or more lines to be reserved at the top and/or the bottom of the Screen for display of system status, operator menu data, table headings, etc. These lines are 'locked' on the Screen; they remain always displayed; data in the Window scrolls behind them. They cannot be accessed, written, or affected (by erase/edit operations) with the primary cursor (ie, the operator's normal cursor).

Host areas are set (reserved) with the zSDP control (2nd and 3rd parameters). They may be reserved first, and then written into with the alternate cursor, or the selected lines may be written into first (with the primary cursor), and then reserved. (Recall that the zSDP control does not affect the contents of Display Memory -- only its partitioning.) If the terminal is used in Monitor SRM (ie, local entry), the host may freely write these areas (using the alternate cursor) without disrupting, or interfering in any way with, the operator's local entry. Examples:

```
ESC [ 60 ; 2 p
```

Reserves a 2-line Host Area at the top of the Screen. This might be used, for example, to capture the heading from a long file so that it remains displayed while you scroll through the rest of the file. (With the file heading displayed at the top of the screen, type this control to lock the heading on the screen. As with all Ambassador controls, if this were a frequent action, you could program the control into a function key, and execute it with a single keystroke. If your host won't echo Escape sequences, just program it as Local-only.)

```
ESC [ 60 ; 3 ; 5 p
```

Reserves a 3-line Host Area at the top of the Screen and a 5-line Host Area at the bottom. The displayed data scrolls between them.

```
ESC [ 60 p
```

Removes all Host Area status. The data that was in the Host Areas is still displayed, but is no longer protected from primary cursor operations.

## SETTING UP MULTIPLE PAGES

The Ambassador's Display Memory may be partitioned and used as independent pages with the zSDP, zPSH, and zPOP controls. The examples below partition the memory into 2 pages, with a 'swap page' string. Many other paging operations are possible. These examples merely illustrate the technique (and the versatility of the Ambassador's control set).

```
ESC [ 60 p ESC [ 30 t ESC [ 30 p
```

This string partitions the memory into two 30-line pages that may be used independently. Each time the string is executed, the pages are swapped, ie, the active page becomes inactive, and the inactive page becomes active. Keyboard and data transfer operations affect only the active page. The inactive page cannot be accessed, written, or affected (by erase/edit operations) with the primary cursor. (The inactive page may be written by the host, if desired, with the alternate cursor; see zACM). The string may be sent by the host, or programmed into a function key for local exe-

cution (ie, a SWAP PAGE key; see below).

ESC [ 60 ; 2 p ESC [ 29 t ESC [ 29 ; 2 p

This string partitions the memory into two 29-line pages with a 2-line Upper Host Area that is always displayed regardless of which page is active.

ESC [ 60 ; 2 p ESC [ 28 t ESC [ 29 H ESC [ 28 s ESC [ 32 ; 2 ; 2 p

This string partitions the memory into two 28-line pages with 2-line Upper and Lower Host Areas that are always displayed regardless of which page is active.

ESC P ` H y ~ [ [ 6 0 { P } ~ [ [ 3 0 { T } ~ [ [ 3 0 { P } ESC \

This string loads the first example into PF1 (making PF1 a SWAP PAGE key).

#### SETTING UP MULTIPLE WINDOWS

In the examples above, only the active page is displayed. It is also possible to have multiple pages displayed, only one of which is active. In the first example above, if we had terminated the string with ESC [ 30 ; ; ; 60 p (instead of ESC [ 30 p), we would have found both pages displayed. In the example below, we divide the screen into three 20-line windows with strings that select which window is active, ie, contains the cursor. The strings may be sent by the host, or programmed into function keys for local execution.

ESC [ 60 ; ; 40 ; 60 p       -Selects window #1 (Lines 1-20)

ESC [ 60 ; 20 ; 20 ; 60 p   -Selects window #2 (Lines 21-40)

ESC [ 60 ; 40 ; ; 60 p       -Selects window #3 (Lines 41-60)

#### USING THE ALTERNATE CURSOR

The Ambassador is equipped with two independent cursors -- primary and alternate. Only one or the other may be in use at any given time (except, in Monitor SRM, local entries from the keyboard use only the primary cursor, whereas the host may use either). The alternate cursor is selected by going into Alternate Cursor Mode. This mode is not available on the Setup lines. It can be changed only with the SM/RM (Set/Reset Mode) controls. (The string ESC [ > 51 h sets it; the string ESC [ > 51 l resets it.)

The significant characteristics of the primary cursor are:

- 1) Its position is confined to the Page.
- 2) Its position (in the Window) is noted with a visible cursor symbol.
- 3) Erase and edit operations using the primary cursor affect only the contents of the Page.

The significant characteristics of the alternate cursor are:

- 1) It can access all of Display Memory, including the Host Areas and Inactive Memory.
- 2) Its position is not visible, even if writing into the Window.
- 3) Erase and edit operations using the alternate cursor affect all of Display Memory.
- 4) Controls that require a line number parameter may require a different parameter value depending on which cursor is used. Address 1 of the primary cursor points to the top line of the Page; address 1 of the alternate cursor points to the top line of Display Memory. These may differ by the number of lines of Upper Host Area. (Note: This was required because the ANSI standard does not provide for the transfer of negative parameters.)

#### HIGHLIGHTING THE DISPLAY

The Ambassador provides five distinct renditions for highlighting the display. The renditions may be used to highlight a particular group of characters (to call attention to them or to visually differentiate them from others on the screen), or it may be used to convey additional information about the characters (eg, type style). This information may be transmitted to the host; see zGRTM (Graphic Rendition Transfer Mode).

OPERATOR CONTROL. No keys are normally assigned to the control of graphic rendition. If desired, the programmable keys may be used. Examples:

```
ESC P ` H ~ [ [ { M } ` I ~ [ [ 4 { M } ` T ~ [ [ 7 { M } ESC \
```

This string makes PF1 a 'Start Normal' key, PF2 a 'Start Underscore' key, and SHIFT-PF1 a 'Start Reverse' key; see Programmable Strings section.

```
ESC P ` H y ~ [ [ { M } ` I y ~ [ [ 4 { M } ` T y ~ [ [ 7 { M } ESC \
```

This string does the same, except that the strings are made Local-only (for hosts that won't echo the controls).

HOST CONTROL. The host uses the SGR control to control the rendition with which subsequent characters are written.

SGR SET GRAPHIC RENDITION (ESC [ Ps..Ps m). Sets a Graphic Rendition (GR) register according to the parameters. The contents of this register are appended to all characters subsequently entered or received, causing them to be displayed as Normal (Ps= 0), Bold (Ps= 1), Underscored (Ps= 4), Blinking (Ps= 5), Reverse (Ps= 7), or Concealed (Ps= 8), in any combination.

Bold is simply brighter than Normal. (The difference is adjustable; see Checkout & Installation section, Initial Turn-on.) Reverse gives black characters on a 'white' background. Concealed causes the characters to be displayed as Spaces (2/0). (Concealed characters are stored correctly, and may be transmitted or printed; they're just not visible.)

Examples:



ESC [ m	Start Normal
ESC [ 1 m	Start Bold
ESC [ 4 m	Start Underscored
ESC [ 5 m	Start Blinking
ESC [ 7 m	Start Reverse
ESC [ 8 m	Start Concealed (black spaces)
ESC [ 7 ; 8 m	Start Concealed (white spaces)
ESC [ 1 ; 4 ; 7 m	Start Bold, Underscored, and Reverse

Note that the renditions do not require separate locations in Display Memory, and may be freely applied by individual character. (The Ambassador's Display Memory is 12-bits-wide, divided 7-bits for character and 5-bits for rendition.)

Note also that the rendition is defined to be an attribute of the character being written, not of a character position in the Page. The rendition is simply part of the character. When the character is moved or erased, its rendition is moved or erased with it.

Unlike earlier generations of many terminals, the rendition carries no control attributes (eg, 'dim' is not associated with 'protected'). The ANSI control DAQ (Define Area Qualifications) is reserved for setting control attributes; see Forms section. The SGR control sets visual attributes, the DAQ control sets control attributes, and the user is free to associate them in any way that may be desired.

The content of the GR-register is also appended to all Space codes (2/0) written or inserted by the Erase/Edit controls (see Editing Controls section), or inserted as the result of a memory scroll (see Writing the Display, above). The desired result follows naturally, whether working with a Normal or Reverse display. Note: Care is required when using a Reverse rendition to highlight a Normal display (or vice versa) and memory scroll is permitted (ie, zSPM reset). If the last character of the line is written Reverse, the terminal assumes the intention is to continue Reverse (as it would be if working with a Reverse display) and scrolls up the blank line in that rendition.

The host may use the zCGR control to change the rendition of characters already written.

zCGR CHANGE GRAPHIC RENDITION (ESC 9). Changes the graphic rendition of all following characters in the Active Area to that selected by the last SGR control. (The Active Area is the Page at power-on; see Forms section.)

Examples:

```
ESC [ 7 m ESC 9
```

This string, if given with the cursor in the Home position, clears the Page to Reverse (ie, black characters on a 'white' background).

```
ESC P p ~ [ [ 7 { M } ~ [ 9 ESC \
```

Loads the preceding string into the non-volatile Power-on string so that the Screen comes up with a Reverse rendition each time the terminal is powered on (for users who prefer working in Reverse).



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## MODES THAT AFFECT THE CURSOR CONTROLS

The following modes affect the terminal's response to some of the cursor controls. If the mode is not mentioned in the description of a control, the control is not affected by the mode. Detailed descriptions of these modes can be found in the Appendix.

zWFM WRAP FORWARD MODE (D,33). Permits the cursor to wrap forward at end of line (to beginning of next line).

zWBM WRAP BACKWARD MODE (D,34). Permits the cursor to wrap backward at beginning of line (to end of preceding line).

zSPM SCROLL-PAGE MODE (D,36). Inhibits additional data entry at end of Page.

TSM TABULATION STOP MODE (D,18). Determines whether columnar tab stops (TSM reset) or page tab stops (TSM set) are affected by the Tab Set/Clear controls.

LNLM LF NEW LINE MODE (D,20). Selects CTRL-J (LF) as the new-line code (instead of CRLF).

zCNM CR NEW LINE MODE (D,55). Selects CTRL-M (CR) as the new-line code (instead of CRLF).

zACM ALTERNATE CURSOR MODE (-,51). Enables the alternate cursor. The primary cursor is confined to the (working) Page and is displayed; the alternate cursor is not.

## MOVING THE CURSOR

The Ambassador provides all of the ANSI standard cursor controls.

**OPERATOR CONTROL.** The operator moves the cursor with the HOME and ARROW keys on the Control keypad. HOME moves the cursor to the first character position in the Page. UP-ARROW moves the cursor up one line. DOWN-ARROW moves it down one line. RIGHT-ARROW moves it right one column. LEFT-ARROW moves it left one column. The ARROW keys repeat when held down, regardless of the setting of zKRM (Key Repeat Mode), unless specifically re-programmed to not repeat; see Programmable Strings section.

**HOST CONTROL.** The host moves the cursor with the following controls. All

cursor controls (except those that reference zSPM) are non-destructive, ie, they cannot affect the contents of the Page. (Those that reference zSPM can move the contents of the Page, if zSPM is reset, losing one line from the Page. If zACM is set, they are non-destructive in all cases, ie, the alternate cursor cannot cause the data to scroll regardless of the setting of zSPM.) Many of the controls take numeric parameters, Pn (up to a maximum value of 255). Illegal parameter values, ie, values that would move the cursor outside the boundaries of the Page, will typically move the cursor to the applicable boundary.

CR CARRIAGE RETURN (CR). Moves the cursor to beginning of the active line. If zCNM is set, it also does an implicit LF. If zCNM is set, zSPM and zACM are reset, and the cursor is in the bottom line of the Page, it does a scroll up of all data in the Page (losing the top line).

LF LINE FEED (LF). Moves the cursor down one line. If LNM is set, it also does an implicit CR. If zSPM and zACM are reset and the cursor is in the bottom line of the Page, it does a scroll up of all data in the Page (losing the top line).

BS BACKSPACE (BS). Moves the cursor left one column. If zDBM (Destructive Backspace Mode) is set, it also erases the character at that position. If zWBM is set, it is permitted to wrap to the preceding line.

CUU CURSOR UP (ESC [ Pn A). Moves the cursor up Pn lines. Examples:

ESC [ A	Moves the cursor up 1 line.
ESC [ 12 A	Moves the cursor up 12 lines.
ESC [ 99 A	Moves the cursor to top of Page (in the same column).

Note: In the last example, since the cursor cannot move 99 lines (in a maximum 60-line page), it moves to the page boundary and stops.

CUD CURSOR DOWN (ESC [ Pn B). Moves the cursor down Pn lines.

CUF CURSOR FORWARD (ESC [ Pn C). Moves the cursor right Pn columns. If zWFM is set, it is permitted to wrap to following lines.

CUB CURSOR BACKWARD (ESC [ Pn D). Moves the cursor left Pn columns. If zWBM is set, it is permitted to wrap to preceding lines.

HPR HORIZONTAL POSITION RELATIVE (ESC [ Pn a). Same as CUF, except limited to the active line regardless of zWFM.

VPR VERTICAL POSITION RELATIVE (ESC [ Pn e). Same as CUD.

IND INDEX (ESC D). Moves the cursor down one line. If zSPM and zACM are reset and the cursor is in the bottom line of the Page, it does a scroll up of all data in the Page (losing the top line).

RI REVERSE INDEX (ESC M). Moves the cursor up one line. If zSPM and zACM are reset and the cursor is in the top line of the Page, it does a scroll down of all data in the Page (losing the bottom line).

NEL NEXT LINE (ESC E). Moves the cursor to the beginning of the next line. If zSPM and zACM are reset and the cursor is in the bottom line of the Page, it does a scroll up of all data in the Page (losing the top line).

CNL CURSOR NEXT LINE (ESC [ Pn E). Moves the cursor down Pn lines to beginning of line.

CPL CURSOR PRECEDING LINE (ESC [ Pn F). Moves the cursor up Pn lines to beginning of line.

HPA HORIZONTAL POSITION ABSOLUTE (ESC [ Pn `). Positions the cursor to column Pn (in the same line).

VPA VERTICAL POSITION ABSOLUTE (ESC [ Pn d). Positions the cursor to line Pn (in the same column). If zACM is set, Pn is offset by the amount of any Upper Host Area setting, eg, with a 3-line Upper Host Area, Pn= 6 (zACM reset) and Pn= 9 (zACM set) both point to line 6 in the Page.

CHA CURSOR HORIZONTAL ABSOLUTE (ESC [ Pn G). Same as HPA.

CUP CURSOR POSITION (ESC [ Pn1 ; Pn2 H). Positions the cursor to line Pn1, column Pn2 (of the Page). If zACM is set, Pn1 is offset by the amount of any Upper Host Area setting; see VPA above. Examples:

ESC [ H	Moves the cursor to line 1, column 1 (Home).
ESC [ 6 H	Moves the cursor to line 6, column 1.
ESC [ ; 12 H	Moves the cursor to line 1, column 12.
ESC [ 6 ; 12 H	Moves the cursor to line 6, column 12.
ESC [ 99 ; 99 H	Moves the cursor to end of Page.

HVP HORIZ & VERT POSITION (ESC [ Pn1 ; Pn2 f). Same as CUP.

## READING THE CURSOR POSITION

The following controls may be used to read the present cursor position. The position reported is that of the primary cursor only, regardless of the setting of zACM.

DSR DEVICE STATUS REPORT (ESC [ Ps n). This control, sent by the host with Ps= 6, requests the terminal to report its cursor position. The terminal responds in the form of a CPR control.

CPR CURSOR POSITION REPORT (ESC [ Pn1 ; Pn2 R). This control is returned to the host in response to the DSR control. It reports the cursor position in the same decimal form used by the CUP and HVP controls. Examples:

ESC [ 01 ; 01 R	Cursor position = line 1, column 1 (Home)
ESC [ 06 ; 12 R	Cursor position = line 6, column 12

## SAVE/RESTORE CURSOR POSITION

The following controls may be used to save and restore the present cursor position (and graphic rendition setting). Either the primary or alternate cursor values may be saved. However, only one set of values may be saved at a time. The 'saved' values may be restored to either cursor.

zSC SAVE CURSOR POSITION (ESC 7). Saves the cursor position (and rendition setting) in a temporary buffer for later recall. If zACM is reset, it saves the primary cursor position (and associated rendition). If zACM is set, it saves the alternate cursor position (and associated rendition).

zRC RESTORE CURSOR POSITION (ESC 8). Returns the cursor position (and rendition setting) to its 'saved' values. If zACM is reset, it restores the values to the primary cursor. If zACM is set, it restores the values to the alternate cursor.

Example:

```
ESC [ > 51 h ESC 7 ESC [ > 51 l ESC 8
```

This string saves the alternate cursor position (and rendition setting) and restores it to the primary cursor. The primary cursor moves to the alternate position and subsequent entries are rendered with the alternate rendition.

## USING COLUMNAR TABS

The Ambassador provides both columnar and full-page tab capabilities. A columnar tab stop applies to an entire column in the Page. A page tab stop applies to a single character position in the Page. Either may be used, but not at the same time. (Setting a page tab stop suspends the effect of columnar tab stops; see Using Page Tabs below.)

Columnar tabs are the more generally used, and usually at a fixed spacing (8 or 10 columns). The Ambassador initializes with an 8-column spacing, ie, with tab stops at columns 1, 9, 17, 25, 33, 41, 49, 57, 65, and 73.

NOTE: If your facility uses a 10-column spacing, the string  
ESC [ 5 W CR ESC H ESC [ 10 C .... ESC H ESC [ 10 C ESC H  
may be used to re-initialize the settings. This string may be  
programmed into the Power-on string so that the terminal comes  
up with the 10-column settings each time it is powered on.

OPERATOR CONTROL. The operator sets and clears tab stops with the T-SET and T-CLR key on the Control keypad. T-SET sets a tab stop at the cursor position; T-CLR clears it. CTRL- T-CLR clears all tab stops. If TSM is reset, these keys set and clear columnar tab stops; otherwise page tab stops. (Note: In Monitor SRM, ie, off-line entry, the operator cannot set and clear page tab stops.)

The operator tabs and backtabs with the TAB key. TAB moves the cursor right to the next tab stop; SHIFT-TAB moves the cursor left to the preceding tab stop. The TAB key repeats when held down, regardless of the setting of zKRM (Key Repeat Mode), unless specifically re-programmed to not repeat. A tab-

with-justify function is available for entering right-justified data (eg, columns of numbers; see HTJ below).

HOST CONTROL. The host sets and clears tab stops with the following controls:

HTS HORIZONTAL TABULATION SET (ESC H). Sets a tab stop at the present cursor position. If TSM is reset, it sets a columnar tab stop, otherwise page.

TBC TABULATION CLEAR (ESC [ Ps g). Clears one or more tab stops according to the selective parameter, Ps. If TSM is reset, it clears columnar tab stops; otherwise page. Examples:

ESC [ g	Clears tab stop at the cursor
ESC [ 2 g	Clears all tab stops in the line
ESC [ 3 g	Clears all tab stops in the Page

CTC CURSOR TABULATION CONTROL (ESC [ Ps W). Alternative control to HTS and TBC; see Appendix.

The host tabs and backtabs with the following controls:

HT HORIZONTAL TABULATION (HT). Moves the cursor right to the next tab stop. If zWFM is set, it is permitted to wrap to the next line. If zSPM and zACM are reset and the cursor is at the last tab stop in the Page, it does a scroll up of all data in the Page (losing the top line).

HTJ HORIZONTAL TAB WITH JUSTIFY (ESC I). Same as HT except that the entry is right-justified before moving to the next tab stop. The control may be loaded into a programmable key for operator use when desired.

CHT CURSOR HORIZONTAL TABULATION (ESC [ Pn I). Moves the cursor right Pn tab stops. If zWFM is set, it is permitted to wrap to following lines.

CBT CURSOR BACKWARD TABULATION (ESC [ Pn Z). Moves the cursor left Pn tab stops. If zWBM is set, it is permitted to wrap to preceding lines.

## USING PAGE TABS

Page tab stops apply to single-character positions in the Page. They may be used to facilitate entry into forms (see Forms section) or display of page-like data. Note: They are typically used with zSPM in the set state (ie, with memory scroll inhibited). A memory scroll moves the contents of the Page, but not the tab stops (by definition). Unless the tab stops are aligned in columns, an inadvertent memory scroll would move the data away from the tab stops.

Setting any page tab stop suspends the effect of columnar tab stops. Only the page tab stops are active. This is true until the Page is purposefully cleared with an RIS control, or by erasing the entire page with ERM set, or by re-defining the Page with the zSDP control. (Simply clearing the last tab stop does not re-institute columnar tabs. This permits the tab clear controls to avoid the time-consuming task of searching for remaining tab stops or DAQ qualifications.) When the Page is so cleared or re-defined, the columnar tab

stops become active again at their previous positions.

Page tab stops are set and cleared with the same keys and controls described above. TSM determines whether they set columnar or page tab stops. Likewise, the same tab and backtab keys and controls are used, moving the cursor according to whichever tab stops are active.



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MODES THAT AFFECT THE EDITING CONTROLS

The mode ERM affects the terminal's response to erase controls:

ERM ERASURE MODE (D,6). Permits the erasure of characters regardless of their protected status; see Forms section.

The mode IRM is an editing mode:

IRM INSERTION-REPLACEMENT MODE (-,4). Permits character entries to be inserted into the Page, pushing the characters presently displayed to the right (instead of overwriting, or replacing, them).

Two controls set internal registers whose settings affect the terminal's response to the controls:

SGR SET GRAPHIC RENDITION (ESC [ Ps..Ps m). Sets a Graphic Rendition (GR) register according to the parameters; see Display section, Highlighting the Display. The contents of this register are appended to all characters subsequently entered or received. It is also appended to all Space (2/0) codes written by the Erase controls, inserted by the Edit controls, or inserted as a result of memory scroll; see zSPM (Scroll-Page Mode).

SEE SELECT EDITING EXTENT (ESC [ Ps Q). Sets an Editing Extent (EE) register according to the parameter. The contents of this register limit the effect of the character edit controls, DCH and ICH, to Page, Line, Field, or Area; see Definitions below.

DEFINITIONS

Certain terms are used in describing the Ambassador's editing features. They are defined below to clarify their usage. These definitions follow, and are consistent with, the ANSI definitions.

PAGE. The portion of Active Memory between the Upper and Lower Host Areas; see Display section. The Page is the only portion of Display Memory that can be accessed, written, or affected (by erase/edit operations) with the primary cursor.

LINE. A portion of the Page having a common vertical position. A Line contains columns 1 through 80.

FIELD. A portion of the Page bounded by tab stops (either columnar or page). A Field contains the character position at the beginning tab stop

and excludes the character position at the trailing tab stop. The Ambassador initializes to ten 8-character Fields per Line; see Cursor Controls section, Using Columnar Tabs.

QUALIFIED AREA. A portion of the Page bounded by area qualifiers; see Forms section. An Area includes the character position at the beginning area qualifier and excludes the character position at the trailing area qualifier. The Ambassador initializes to one Area (equal to the Page).

ACTIVE. Applied to a portion of the Page, refers to the portion that contains the cursor, eg, the Active Line is the Line that presently contains the cursor.

#### ERASING THE DISPLAY

All erase operations consist of writing Space (2/0) codes into the selected regions of memory. Each Space code is tagged with the present setting of the GR-register (see SGR).

OPERATOR CONTROL. The operator may erase portions of the Page with the following keys:

SPACE BAR. Erases the character at the cursor. If zKRM (Key Repeat Mode) is set, it repeats if held down.

BACKSPACE. If zDBM (Destructive Backspace Mode) is set, backspaces and erases the character at that position. If zKRM is set, it repeats if held down.

ERASE. ERASE erases from cursor to end of Line. SHIFT-ERASE erases from cursor to end of Page. This key is programmable on both levels. Its functions may be disabled or changed, if desired; see Programmable Strings section. (Note: In Monitor SRM, ie, off-line entry, ERASE is confined to the Active Qualified Area, and SHIFT-ERASE will not erase Areas designated as protected regardless of the setting of ERM; see Forms section.)

HOST CONTROL. The host may erase portions of the Page with the following controls. The controls ED, EL, EF, and EA erase defined regions; see Definitions above. In addition, each permits one of three selective parameters to further specify whether the erase is to be from cursor to end of region (Ps= 0), from beginning of region to cursor (Ps= 1), or the entire region (Ps= 2).

ED ERASE IN DISPLAY (ESC [ Ps J). Erases some or all of the Page according to the parameter, Ps. Examples:

ESC [ J	Erases from cursor to end of Page
ESC [ 1 J	Erases from beginning of Page to cursor
ESC [ 2 J	Erases the entire Page

EL ERASE IN LINE (ESC [ Ps K). Erases some or all of the Active Line according to the parameter.

EF ERASE IN FIELD (ESC [ Ps N). Erases some or all of the Active Field according to the parameter.

EA ERASE IN AREA (ESC [ Ps O). Erases some or all of the Active Qualified Area according to the parameter.

The host may also erase a specified number of characters (up to 255).

ECH ERASE CHARACTER (ESC [ Pn X). Erases the following Pn characters, starting with the character at the cursor.

## EDITING THE DISPLAY

OPERATOR CONTROL. The operator may edit portions of the Page with the following keys:

EDIT. Toggles the terminal into and out of Insertion-Replacement Mode (IRM). In Insertion Mode, character entries are inserted into the Page, pushing the characters presently displayed to the right (instead of overwriting, or replacing them).

Note: If it is desired to have visual feedback that the terminal is in Insertion mode (eg, during off-line entry), the key may be re-programmed to include the zTFC (Toggle Fast-blink Cursor) control (ie, ESC 5 ESC 6). This causes the cursor to fast-blink whenever the terminal is put into Insertion mode (with the EDIT key).

DELETE. Deletes the character at the cursor and moves the following characters left to fill the space. SHIFT-DELETE deletes the entire line containing the cursor and moves the following lines up.

INSERT. Moves the character at the cursor to the right, opening a space. SHIFT-INSERT moves the entire line containing the cursor down, opening an empty line.

In all cases, the extent of the Page affected is determined by the Select Editing Extent setting near the end of Setup line D. It should normally be set to 1 (= Line). (Note: In Monitor SRM, ie, off-line entry, the effect of these keys is confined to the Active Qualified Area regardless of the Select Editing Extent setting; see Forms section.)

The DELETE and INSERT keys repeat when held down, regardless of the setting of zKRM (Key Repeat Mode), unless specifically re-programmed not to repeat. All three keys (including EDIT) are programmable. Their functions may be disabled or changed if desired; see Programmable Strings section.

HOST CONTROL. The host may edit portions of the Page with the following controls.

DCH DELETE CHARACTER (ESC [ Pn P). Deletes Pn characters, starting with the character at the cursor, by shifting the remaining characters (in the editing region) to the left. Character positions vacated at the end of the editing region are erased. Examples:

ESC [ P	Deletes 1 character
ESC [ 12 P	Deletes 12 characters

ICH INSERT CHARACTER (ESC [ Pn @). Inserts Pn spaces (2/0) at the cursor by shifting the character at the cursor, and all following characters (in the editing region), to the right. Characters shifted past the end of the editing region are lost.

Instead of using the ICH control to open up a space and then writing into it, the host may put the terminal into the Insertion (set) state of IRM and insert the characters directly. The SM sequence, ESC [ 4 h, puts the terminal into Insertion mode. The RM sequence, ESC [ 4 l, returns it to Replacement mode. (Alternatively, the control zTI, Toggle IRM, ESC 6, may be used. This is the control generated by the operator's EDIT key.)

SEE SELECT EDITING EXTENT (ESC [ Ps 0). Sets an Editing Extent (EE) register according to the selective parameter. The contents of this register limit the effect of the character edit controls, DCH and ICH, and entries in the Insertion state of IRM, to Page (Ps= 0), Line (Ps= 1), Field (Ps= 2), or Qualified Area (Ps= 3); see Definitions above. Examples:

ESC [ 0	Selects end of Page (as the end of the editing region)
ESC [ 1 0	Selects end of Line
ESC [ 2 0	Selects end of Field
ESC [ 3 0	Selects end of Qualified Area

DL DELETE LINE (ESC [ Pn M). Deletes the contents of Pn lines, starting with the Active Line, by shifting the remaining lines in the Page upward. Lines vacated at the end of the Page are erased.

IL INSERT LINE (ESC [ Pn L). Inserts Pn erased lines by shifting the contents of the Active Line, and all following lines, downward. Lines shifted past the end of the Page are lost.

zPSH PUSH LINE (ESC [ Pn s). Moves the contents of Pn lines, starting with the Active Line, to the bottom of the Page, by shifting the bottom lines of the Page upward.

zPOP POP LINE (ESC [ Pn t). Moves the contents of Pn lines at the bottom of the Page to (start at) the Active Line, by shifting the Active Line, and all following lines, downward.

NOTE: The zPSH and zPOP controls permit re-arranging the data in the Page without re-transmitting; see also Display section, Setting Up Multiple Pages.

#### USING THE zSDP CONTROL IN EDITING

The standard controls provide a great deal of versatility in confining the effect of erase and edit operations to defined regions. The zSDP control extends this versatility even more.

The zSDP control defines the 'Page'. It partitions memory, but does not change it's contents; see Display section, Definitions. Erase and edit operations, by definition, act only on the contents of the Page. The zSDP control permits the effect of these operations to be confined to specified lines.

**Example:**

Assume a 60-line Page, SEE set to 0 (edit to end of Page), and a 9-line paragraph in lines 20 through 28. The zSDP control, ESC [ 28 ; 19 p, narrows the Page to contain only the paragraph. The erase and edit controls now act only on the paragraph; the remaining text is unaffected. When the paragraph has been edited, the zSDP control, ESC [ 60 p, returns the Page to its prior setting.



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## MODES THAT AFFECT TRANSMISSION

The following modes affect the transmission of data from the terminal's display memory to the host. Their settings can be reviewed, and changed as desired, on the Setup lines; see Setup section. The Setup line letter, and mode number, are shown in parentheses following the name. Detailed descriptions of these modes can be found in the Appendix.

zTPDM TRANSFER POINTER DISPLAY MODE (A,41). During a transmission, the cursor symbol is not displayed (since the keyboard is disabled). This mode permits a transfer pointer symbol to be displayed (as feedback to the operator that the terminal is in the transmit state and that transmission is occurring).

zAKDM AUTO KEYBOARD DISABLE MODE (B,46). Upon completion of a transmission, the keyboard is automatically re-enabled (and the cursor symbol returns). This mode permits the keyboard to remain disabled, until purposefully released by the host with an EMI control.

zLTM LINE TRANSFER MODE (B,42). A transmission normally continues until completion. For hosts that cannot buffer a full Page, this mode permits the the terminal to stop transmitting at the end of each line (requiring the host to send a DC1-code (1/1) to obtain the next line).

NOTE: The terminal will respond normally, in all modes, to a DC1/DC3 protocol (or use of the Clear-to-Send interface signal) to start/stop transmission.

TTM TRANSFER TERMINATION MODE (B,16). A transmission will normally terminate after sending the character at the cursor position. This mode permits the transmission to continue to end of Page.

zGRM GRAPHIC RENDITION TRANSFER MODE (B,45). The characters in the Page are normally transmitted without information regarding their rendition. This mode permits this information to be transmitted, by including the necessary SGR controls in the transmissions.

GATM GUARDED AREA TRANSFER MODE (B,1). Areas of the Page may be designated as guarded (ie, their contents are not normally to be transmitted); see Forms section. This mode permits the contents of these Areas to be included in the transmissions.

The following modes permit trailing Space codes (2/0) to be suppressed in the transmissions.

FETM FORMAT EFFECTOR TRANSFER MODE (B,14). Permits trailing Spaces to be suppressed at end of line (if FETM is reset). A New-Line code is inserted to mark their omission. LNM (LF New Line Mode) selects CRLF (LNM reset) or LF (LNM set) as the New-Line code.

zCSTM COLUMN SEPARATOR TRANSFER MODE (B,43). Permits trailing Spaces to be suppressed at each Columnar tab stop. An HT-code (0/9) is inserted to mark their omission.

zFSTM FIELD SEPARATOR TRANSFER MODE (B,44). Permits trailing Spaces to be suppressed at each Page tab stop. An HT-code is inserted to mark their omission.

The following modes permit Selected Area transmission; see Using Selected Areas below.

SATM SELECTED AREA TRANSFER MODE (B,17). Permits transmission of the Active Selected Area (if SATM is reset).

MATM MULTIPLE AREA TRANSFER MODE (B,15). Permits transmission of all Selected Areas in the Page (if SATM is reset).

#### INITIATING TRANSMISSION

OPERATOR CONTROL. The operator will normally initiate transmission with the SEND key. The SEND key controls two programmable strings; see Programmable Strings section.

One is active during Simultaneous SRM (ie, normal conversational entry). It is initialized to null at power-on. It can be programmed with whatever control string is desired (and can be accommodated by the host); see Using the Transfer Pointer, below. If the string is always wanted, the programmable Power-on string may be used to load the key with the string each time the terminal is powered on.

The other string is active during Monitor SRM (ie, off-line entry). It is initialized with the STS control at power-on. When the key is typed, transmission starts at the top of the Page and terminates with the cursor (TTM reset) or end of Page (TTM set). The content of the transmission, whether a transfer pointer is displayed, etc, is determined by the various modes; see above. The key can likewise be re-programmed with other control strings that the user might find useful.

HOST CONTROL. The host initiates transmission with the STS control.

STS SET TRANSMIT STATE (ESC S). Initiates transmission (provided the terminal's communications interface is ready; see Flow Control of Transmitted Data below). The transmission starts at the top of Page and terminates with the cursor (TTM reset) or end of Page (TTM set). The region transmitted can be narrowed (to as small as a single character) with the zSTP and zSTE controls; see Using the Transfer Pointer. Sub-regions



may be excluded from the transmission; see Using Guarded Areas and Using Selected Areas.

#### FLOW CONTROL OF TRANSMITTED DATA

The transmission of data from the terminal's memory to the host is controlled by two flags in the terminal and a communications input.

A Transmit Ready Flag (TRF) indicates that transmission is desired. It is set by the STS control, whether entered by the operator or received from the host. It is reset at power-on and at the end of each transmission. It may also be reset by the operator with the BREAK or SETUP keys, or by the host with the INT control; see Aborting the Transmission below.

A Communications Ready Flag (CRF) indicates that the communications interface is ready to send the data. It is set at power-on. It can be set and reset by the host with the DC1 (1/1) and DC3 (1/3) controls. If zLTM is set, it is automatically reset after each line is transmitted.

A Clear-to-Send (CTS) input signal at the communications connector (pin 5) indicates that the external communications system is ready to accept the data. This input may be controlled by the external system, or it may be left open (if the external system is always ready); see Checkout & Installation section.

All three conditions must be ready for transmission to occur. Therefore, the actual transmission may be initiated by any one of the conditions by first setting the others. The transmission may be suspended by resetting CRF or by pulling the CTS input low. The transmission may be terminated only by resetting TRF.

#### ABORTING A TRANSMISSION

**OPERATOR CONTROL.** The operator may abort a transmission by typing the BREAK or SETUP key.

**HOST CONTROL.** The host may abort a transmission by sending the INT control.

INT INTERRUPT (ESC a). Terminates a transmission in progress.

NOTE: This control is detected at the input of the terminal's FIFO buffer. The host may send other controls during the transmission (to be executed upon completion of the transmission) without interfering with its ability to abort the transmission.

If a trailer string has been programmed (see Header and Trailer Strings below), aborting a transmission aborts only the text portion of the transmission; the trailer string is still sent.

## HEADER AND TRAILER STRINGS

The Ambassador provides programmable Header and Trailer strings; see Programmable Strings section. Both are initialized to null at power-on. If programmed, the Header string precedes, and the Trailer string follows, all STS-initiated transmissions. Example:

```
ESC P ` Sp ~ B | ~ C ESC \
```

This string programs an STX (0/2) into the Header string and an ETX (0/3) into the Trailer string. All STS-initiated transmissions will now begin with an STX and end with an ETX.

```
ESC p ~ [ P { @ } Sp { ^ } B { \ ^ } C ~ [ \ ESC \
```

This string programs the preceding string into the programmable Power-on string, so that the string is executed each time the terminal is powered on.

## USING THE TRANSFER POINTER

Transmission normally starts at the beginning of Page, and ends with the cursor (TTM reset) or end of Page (TTM set). The Ambassador provides two controls that permit the starting and ending points to be specified anywhere within the Page.

zSTP SET TRANSFER POINTER (ESC [ Pn1 ; Pn2 u). Sets the starting address of the transfer pointer to line Pn1, column Pn2. The transmission includes the character at this position. The default value (for line and/or column) is the present cursor position.

zSTE SET TRANSFER END (ESC [ Pn1 ; Pn2 z). Sets the ending address of the the transfer pointer to line Pn1, column Pn2. The transmission includes the character at this position. The default value (for line and/or column) is the present cursor position. Note: If TTM is reset (ie, transmit to cursor), if the cursor is encountered before reaching the specified endpoint, the transmission will terminate after transmitting the character at the cursor. This may be avoided by setting TTM.

Examples:

```
ESC [ u ESC [ z ESC S
```

This string transmits the character at the cursor. If a Header and Trailer string are programmed, they will precede and follow the character.

```
ESC [ ; 1 u ESC [ ; 80 z ESC S
```

This string transmits the entire contents of the active line (ie, the line containing the cursor). If FETM is reset, any trailing spaces are suppressed and the transmission is terminated with the new-line character selected by LNM. Alternatively, FETM may be set and the new-line character programmed into the Trailer string.

```
ESC P ` " ~ [ [ ; 1 { U } ~ [ [ ; 80 { Z } ~ [ S ESC \
```

This string programs the preceding string into the SEND key to provide a Line Transmit function during Simultaneous SRM. The contents of the

active line are now sent to the host whenever the SEND key is typed.

```
ESC [ ; 2 u ESC [ ; 80 z ESC S
```

If your system uses a 1-character prompt, this string transmits the line without transmitting the prompt.

```
ESC [ 6 ; 1 u ESC [ 12 ; 80 z ESC S
```

This string transmits the contents of lines 6 through 12 of the Page.

Note: The preceding example could also have been done using the zSDP control. The zSDP control defines the 'Page'. It partitions memory, but does not change its contents; see Display section, Definitions. The STS control sends only the contents of the Page (TTM set). The string, ESC [ 12 ; 5 p ESC S, would have accomplished the same function with fewer codes (ignoring the fact that the Page still has to be restored). The transfer pointer controls are more versatile (because they permit column parameters).

#### USING SELECTED AREAS

The Ambassador provides a Selected Area capability that permits the region(s) of the Page (to be transmitted) to be selected by visible symbols in the display. A Selected Area is defined as starting with an SSA symbol (forward-pointing triangle) and ending with an ESA-symbol (backward-pointing triangle).

The operator can enter (or insert) these symbols with the SSA and ESA keys on the Control keypad. The host enters them with the SSA and ESA controls.

SSA START OF SELECTED AREA (ESC F). Writes an SSA-symbol to the Page.

ESA END OF SELECTED AREA (ESC G). Writes an ESA-symbol to the Page.

These symbols are characters, just like any of the other graphic characters. They may be erased with erase controls, moved with edit controls, and are included in transmissions (as their escape sequence).

The symbols assume a control attribute only when SATM is in the reset state. In that case, they affect the transmission according to the setting of MATM.

If MATM is reset, only the active Selected Area (ie, the one containing the cursor) is transmitted. If TTM is reset (ie, transmit to cursor), the transmission includes the SSA-symbol and all following text through the character at the cursor.

If MATM is set, all Selected Areas in the Page (or up to the cursor, if TTM is reset) are transmitted. The contents of each area are bracketed by SSA and ESA symbols in the transmission.

#### USING GUARDED AREAS

The Ambassador provides a Guarded Area capability that permits designated regions in the Page to be 'guarded' from transmission. The regions are designated by the host with the DAQ control; see Forms section. They are normally

intended for use with Forms, but may also be used by the host simply to exclude designated regions of the Page from the transmission. Example:

```
ESC [ 6 H ESC [ 1 o ESC [ 9 H ESC [ o ESC S ESC [ 60 p
```

This string excludes lines 6-8 of the Page from the transmission and restores the Page (to 60 lines).

NOTE: Selected and Guarded Areas provide alternative means of accomplishing the same result, namely selective transmission of designated regions of the Page. It is envisioned that the operator will tend to use Selected Areas (because of the visible symbols) and the host Guarded Areas. Using the two types of areas in combination is not recommended. Doing so will yield predictable, but not necessarily sensible, results.

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## USING THE PRINTER

The Ambassador provides three different methods of printing:

**REMOTE COPY.** Permits the terminal and printer to be used as two separate devices, merely sharing a common communications line.

**LOCAL COPY.** Permits printing all or part of the data that the host sends or echoes to the terminal.

**PAGE PRINT.** Permits printing all or part of the displayed data.

The operation and use of these printing methods is described in this section. It assumes that the printer has already been attached to the terminal and properly set up (baud rate, parity, new-line character, new-line pads, etc.); see Checkout & Installation, Printer Installation.

## PRINTER SETUPS

The Ambassador permits a wide variety of printers to be used. There are few requirements of the printer (other than that it accept a new-line control, either CR, LF, or CRLF). If the printer accepts an FF (0/12) control (to advance the paper to top-of-page), it may be used (with all forms of print). If the printer is capable of an Xon/Xoff protocol (either codes or signal), it also may be used. Any other printer features are usable only with Remote Copy (as the Ambassador does not support embedded control codes in either Local Copy or Page Print).

The settings associated with the printer are consolidated on Setup line C; see Setup section. Besides adapting the Ambassador to various printers, they provide some local control of the printout.

The following settings are applicable to all forms of print. They control the basic signal form of data to the printer.

**BAUD RATE.** Sets the baud rate (110-19200) required by the printer. This will generally be set to the maximum that the printer will accommodate.

PARITY. Sets the parity (00=Odd 01=Even 10=Space 11=Mark) required by the printer. If none, set for Mark.

STOP BITS. Sets the number of stop bits required by the printer. This will generally be set to the minimum that the printer will accommodate.

The following settings are applicable to Local Copy and Page Print only. In Remote Copy, the host determines what codes are used for new-line and new-page actions, and whether pad characters are required.

NEW-LINE PADS. Sets the number of NUL-codes (0/0) to be sent to the printer following each new-line character (to allow time for carriage return, if needed).

NEW-LINE CR/LF. Selects the codes (01=LF 10=CR 11=CRLF) required by the printer to perform a new-line action.

FORM FEED. Selects the code (0=NLS 1=FF) required by the printer to perform a new-page action. If the printer recognizes an FF-code (0/12) as a top-of-page control, set to 1; otherwise, set to 0, and the terminal will generate the necessary number of new-line codes to advance the paper to the top of the next page.

The following settings are also applicable to Local Copy and Page Print only. In Remote Copy, the page and margins are controlled by the host. These settings may also be set by the host with the zSPF control; see Top-of-Page Control, below.

PRINTED LINES. Sets the number of lines to be printed per page (eg, 60 leaves a 3-line top and bottom margin on a 66-line printer).

TOTAL LINES. Sets the number of lines possible per page (eg, 66, for a 6 line/inch printer with 11-inch paper).

LEFT MARGIN. Sets the number of Spaces (2/0) to be sent to the printer at the beginning of each line for a left margin (eg, 12 gives a 1-inch left margin for a 12 character/inch printer, provided that the paper is positioned so that, with no margin, the first character prints at the left edge of the paper.)

## FLOW CONTROL

The Ambassador accommodates printers that use either DC1/DC3 codes, or an RS232 control signal, for ready/busy control.

The Ambassador will suspend further transfer of data to the printer on receipt of a 'busy' signal from the printer (either a DC3 control received through pin 2 of the printer connector, or an RS232 'off' level at pin 20). It will resume transferring the data on receipt of a 'ready' signal from the printer (either a DC1 control received through pin 2 of the connector, or an RS232 'on' level at pin 20).

This is applicable to all three methods of printing; see the Flow Control paragraph in the description of each method, below.

## TOP-OF-PAGE CONTROL

If the printer uses paper other than roll stock, it is necessary that the printer and printing source agree on the location of top-of-(printed)page.

When using Remote Copy, this is a matter between the host and printer; the terminal is not involved in the paging operation. The operator typically positions the paper to top-of-page at (printer) power-on, and thereafter the host takes care of the paging. (If the printer has a printed line counter, it is typically initialized to top-of-page at power-on.) If the operator aborts a print, he/she will typically use the Form Feed button on the printer (if it has one, and is convenient), or a pre-arranged code sequence with the host, to advance the paper to the top of the next page.

When using Local Copy or Page Print, the terminal is the printing source, and controls the paging operation. The terminal knows what constitutes a printer page by virtue of the Total Lines setting. It knows how many lines you want to print per page by virtue of the Printed Lines setting. Once the printer is initialized, the terminal takes care of the paging, with a printed-lines counter. The counter is initialized to top-of-page at power-on. Thereafter, it counts the lines it prints, and advances the paper to the top of the next page (by issuing an FF-code, or the necessary number of new-line codes) in accordance with your settings.

If a print is aborted, the terminal's line counter, the printer's paper position, and the printer's line counter (if applicable) are all left at other than top-of-page. The Ambassador's zSPF control permits all three to be advanced to the top the the next page, or only the terminal's line counter (the printer being advanced by other means).

This control may be used by the operator by typing it in, or loading it into a programmable key.

zSPF SET PRINT FORMAT (ESC [ Pn1 ; Pn2 ; Pn3 w). Sets the number of Printed Lines (Pn1), Total Lines (Pn2), and Left Margin (Pn3) (see Printer Setups, above) AND advances the terminal's printed-line counter to top-of-page (with or without advancing the printer; see examples below).

```
ESC [ 60 ; 66 ; 10 w
```

Sets Printed Lines = 60, Total Lines = 66, and Left Margin = 10, AND advances the terminal's line counter to top-of-page (without advancing the printer). The paper should be positioned to top of page (and the printer's line counter reset, if applicable) before issuing this command.

```
ESC [ 62 ; ; 12 w
```

Changes the Printed Line and Left Margin settings without changing the Total Line setting, AND advances the terminal's line counter to top-of-page, without advancing the printer.

```
ESC [ w
```

Changes no settings, but advances the terminal's line counter to top-of-page by issuing new-line codes (or an FF-code, if the Form Feed setting on Line C is selected) to advance the paper position (and line counter setting) in the printer to top-of-page. This may be used

after aborting a Local Copy or Page Print to advance both terminal and printer to the top of the next (printed) page.

```
ESC P ` H y ~ [ [ { W } ESC \
```

This string loads the preceding control into PF1 (making PF1 a New Page key).

#### USING REMOTE COPY

Remote Copy permits data to be printed without being displayed. It may be used by either the operator or the host (although intended primarily for the host).

NOTE: Remote Copy is the only way of printing a file that contains embedded printer control codes. As such, it is the preferred method of printing (if the host is cooperative; see Unix example below).

PRINTER SETUPS. Remote Copy uses only the Baud Rate, Parity, and Stop Bit settings on Setup line C. All other settings are ignored. (The other settings affect the content of the transfer which, in Remote Copy, is controlled entirely by the host).

FLOW CONTROL. The data transferred from the host to the printer is buffered through the terminal's FIFO. The FIFO receives characters from the host at the host's baud rate. It passes those characters on to the printer at the printer's baud rate. In addition, it responds to any 'busy' signal from the printer (either a DC3 control received through pin 2 of the printer connector, or a low level at pin 20), and suspends passing on the characters until it receives a 'ready' signal from the printer (either a DC1 control received through pin 2 of the connector, or a high level at pin 20).

If the printer's baud rate is less than the host's, or if the printer goes 'busy', the FIFO will gradually fill. When the FIFO becomes 'almost full', it sends an XOFF control to the host, suspending further transmission from the host (if the host supports an Xon/Xoff protocol; see ZAXM). When enough data has been printed that the terminal's FIFO becomes 'almost empty', the terminal sends an XON control to the host to resume transmission.

OPERATOR CONTROL. The operator may use the zSRC control to write directly from the keyboard to the printer (either in Local Test mode, see Diagnostics section, or echoed through the host). The control may be typed in, or loaded into a Programmable key. Depressing CTRL-C (ie, ETX) terminates writing to the printer. Example:

```
ESC [ v
```

Starts Remote Copy. All characters subsequently typed are sent to the printer (instead of the display). Depressing CTRL-C returns the terminal to normal operation.

```
ESC P ` H ~ [ [ { V } ESC \
```

This string loads the Start Remote Copy control into PF1.



HOST CONTROL. The host may use the zSRC control to write to the printer. (If it is desired to write also to the display, Local Copy should be used.) The data to be printed may be interspersed (in small packets) with the normal communications to the display (by using the numeric parameter), or printed in a batch by using an ETX to terminate the print.

zSRC START REMOTE COPY (ESC [ Pn v). Causes the next Pn characters (up to 255) to be directed to the printer (instead of the display). If no parameter is given, all subsequent characters are directed to the printer until the first occurrence of an ETX-code (0/3) in the data stream. All formatting of the data is the responsibility of the host. The terminal merely passes the buffered data to the printer interface. (Note: This is a 7-bit data path; no provision has been made for passing 8-bit data.)  
Examples:

```
ESC [ 128 v
```

Causes the next 128 characters sent to the terminal to be directed to the printer only. The 129th, and subsequent characters, are directed back to the display.

```
ESC [ v
```

Causes all subsequent characters sent to the terminal to be directed to the printer only, until an ETX character is sent to direct the characters back to the display.

UNIX EXAMPLE. The following illustrates the use of Remote Copy, using the Unix nroff command.

```
nroff [option] ... [file] ... | print
```

where 'print' is a command file containing:

```
echo ^[[v
cat $*
echo ^C
```

#### USING LOCAL COPY

Local Copy permits data to be displayed and printed simultaneously. It may be used by either the operator or the host. Local copy lacks the versatility of Remote Copy (for formatted printing), but requires no cooperation from the host. The host needs no information about the printer (or even whether there is one).

Local Copy can be faster than Remote Copy when the comm rate is slower than the printer (eg, using a 40 char/sec. printer with a 300 baud modem), because the terminal expands the controls used by the host into the characters required by the printer. (For example, tab codes from the host are expanded into the appropriate number of spaces for the printer. The new-line character used by the host is translated into the new-line character(s) required by the printer, including new-line pads. Etc.)

Local Copy may also be used for logging the transactions between operator and host, for debug or historical reference.

PRINTER SETUPS. All settings are applicable. Since the printing is done from the Page, the host needs no information about the printer being used (unlike Remote Copy). Each line is printed as it finally appears on the screen, regardless of what formatting and editing controls were used in creating it. The only control needed by the printer is a new-line control (selected on Setup line C). If the printer recognizes an FF-code (0/12) as a top-of-page control, the Form Feed setting should be selected. The Left Margin setting may be used to position the printout laterally on the paper. The Printed Lines setting may be used to control the number of lines per page to be printed.

FLOW CONTROL. Whenever a new-line control is received by the Display Processor (ie, after the FIFO, but before moving the cursor), the Display Processor checks to see if Local Copy is 'on'. If so, it tags the active line (ie, the line containing the cursor) as a line to be printed. New-line controls are LF, IND, NEL, or CR (if zCNM is set).

During printing, the terminal's FIFO and its entire Page (see Display section, Definitions) serve as a buffer. The Page is being filled at the host's baud rate. The contents of the Page (ie, the lines tagged to be printed) are being copied to the printer at the printer's baud rate. In addition, the terminal responds to any 'busy' signal from the printer (either a DC3 control received through pin 2 of the printer connector, or a low level at pin 20), and suspends copying further characters until it receives a 'ready' signal from the printer (either a DC1 control received through pin 2 of the connector, or a high level at pin 20).

If the printer's baud rate is less than the host's, or if the printer goes 'busy', the Page will gradually fill. When a new-line control is received by the Display Processor that, if processed, would cause a line that has not yet been printed to scroll off the top of the Page, the scroll is inhibited, and further processing from the FIFO is suspended.

As the host continues to send characters, the FIFO will gradually fill. When the FIFO becomes 'almost full', it sends an XOFF control to the host, suspending further transmission from the host (if the host supports an Xon/Xoff protocol; see zAXM).

When the line at the top of the Page has been printed, the Page is allowed to scroll, FIFO processing is resumed, and another line of data is admitted to the Page.

When enough lines of data have been admitted to the Page that the FIFO becomes 'almost empty', the terminal sends an XON control to the host to resume transmission.

OPERATOR CONTROL. The operator uses SHIFT-PRINT to toggle the terminal into and out of Local Copy. This is a Local-only control, ie, no code is transmitted to the host; see Programmable Strings section.

To log transactions, depress SHIFT-PRINT (to toggle Local Copy on). All subsequent transactions (ie, everything that's written to the display) is also printed. Depress SHIFT-PRINT again (to toggle Local Copy off) to terminate logging.

To print a file, depress SHIFT-PRINT, and initiate display of the file. When

the file has been printed, depress SHIFT-PRINT again (or initiate display of another file to be printed).

Toggling Local Copy on before initiating the display of a file results in the host command (used to initiate the display) to also be printed. To avoid this, SHIFT-PRINT must be depressed AFTER the host command has been echoed and BEFORE the first line of the file has been (completely) written to the display. This requires a fast finger, or a slow host, or a host with a delay (or sleep) command.

Alternatively, zAPM (Auto Pause Mode) may be used; see Display section, Flow Control of Received Data. Depress CTRL-PAUSE (to go into Auto Pause Mode). Initiate display of the file. Depress PAUSE (to permit the echoed command line to display). Depress SHIFT-PRINT (to toggle Local Copy on). Now, each time you depress PAUSE, another line is admitted to the screen -- and printed. You may step through the file, a line at a time, printing what you want and leaving out what you don't want (by toggling Local Copy on and off), or you may depress CTRL-SHIFT-PAUSE (to leave Auto Pause Mode) and the file will complete printing by itself (and without the command line).

To stop the printing of a file (when you only wanted part of it), simply depress SHIFT-PRINT. The line being written to the display at the time the key is depressed will not be printed; all previous lines will.

To abort the printing of a file (because something's gone wrong), depress CTRL-SHIFT-RESET (which clears the display and resets Local Copy), re-position the printer to top-of-page (see Top-Of-Page Control), and re-initiate display of the file.

If Local Copy is used frequently, you may wish to program separate Copy On and Copy Off keys. Example:

```
ESC P ` H y ~ [ [ 4 { I } ` T y ~ [ [ 5 { I } ESC \
```

This string programs SHIFT-PF1 to turn Local Copy on and PF1 to turn Local Copy off.

HOST CONTROL. The host uses the MC control to turn Local Copy on and off.

MC MEDIA COPY (ESC [ Ps i). Controls the transfer of data from the terminal's Display Memory to the printer according to the selective parameter. Ps= 5 turns on Local Copy; Ps= 4 turns off Local Copy.

Lines longer than 80 characters may be printed by allowing the (display) line to wrap at end of line. (Display wrap does not cause the line to be printed; only a new-line control does.) Top-of-page control is available to the host by issuing an FF (0/12) control in the transmission; see FF. (The terminal buffers the FF-code, with the data to be printed, and passes it on to the printer either as an FF-code or the necessary number of new-line codes, depending on the Form Feed setting of Line C.)

USING PAGE PRINT.

Page print permits all or selected portions of the displayed data to be printed. Because of the Ambassador's 60-line display, a full (printed) page of

data (less a 3-line top and bottom margin) may be assembled, edited, formatted, reviewed, and then printed. The data is printed exactly as it is displayed.

**PRINTER SETUPS.** The Left Margin setting shifts the printout to the right. The Printed Lines setting should be greater (eg, 66) than the number of lines set for the (display) Page size; see Display section, Definitions. The displayed data may be divided into two separate printed pages by setting the Printed Lines to be smaller than the Page size.

**FLOW CONTROL.** During a Page Print, characters are transferred from the terminal's Display Memory to the printer at the baud rate selected in Setup line C. The terminal responds to any 'busy' signal from the printer (either a DC3 control received through pin 2 of the printer connector, or a low level at pin 20), and suspends transferring further characters until it receives a 'ready' signal from the printer (either a DC1 control received through pin 2 of the connector, or a high level at pin 20).

The keyboard is disabled during the print operation (except for the BREAK, SETUP, and RESET keys; see KAM), and characters are not being processed from the FIFO into Display Memory. If the host continues to send characters to the terminal, the FIFO will gradually fill. When the FIFO becomes 'almost full', it sends an XOFF control to the host, suspending further transmission (if the host supports an Xon/Xoff protocol; see zAXM). When the print operation has been completed (or aborted), the keyboard and FIFO processing are re-enabled, and any characters waiting in the FIFO are processed normally. When enough characters have been processed that the terminal's FIFO becomes 'almost empty', the terminal sends an XON control to the host to resume transmission.

**OPERATOR CONTROL.** The operator initiates Page Print with the PRINT key.

Before initiating print, make sure the printer is set to top-of-form (if applicable). Upon completion of Page Print, the Ambassador does not automatically advance the printer to the top of the next page (to allow you to compile segments of text on a single page, if desired). The form feed must be done manually between Page Prints. You may use the Form Feed button on your printer (if it has one and is convenient) or you may program a Form Feed key on the terminal; see Top-of-Page Control, above.

A Page Print may be aborted with either the BREAK or SETUP key (without clearing the data), or with CTRL-SHIFT-RESET.

**HOST CONTROL.** The host initiates Page Print with the MC control.

MC MEDIA COPY (ESC [ i). Initiates transfer of data from the terminal's Display Memory to the printer. The transfer starts at the top of the (display) Page and terminates with the cursor (TTM reset) or end of Page (TTM set). The region transmitted may be narrowed (to as small as a single character) with the zSTP and zSTE controls; see Using the Transfer Pointer. Sub-regions may be excluded from the transfer; see Using Guarded Areas and Using Selected Areas.

The host may advance the printer to the top of the next page with the zSPF control (ESC [ w). The host may abort a Page Print in progress with the INT control (ESC a). The host may request that it be notified when a Page Print

(it initiates) has been completed with the DSR control (ESC [ > 5 n); the terminal returns the string, ESC [ n, upon completion of the Page Print.

#### MODES THAT AFFECT PAGE PRINT

The following modes affect Page Print. Their settings may be reviewed, and changed as desired, on the Setup lines; see Setup section. The Setup line letter, and mode number, are shown in parentheses following the name. Detailed descriptions of these modes can be found in the Appendix.

zTPDM TRANSFER POINTER DISPLAY MODE (A,41). During a Page Print, the cursor symbol is not displayed (since the keyboard is disabled). This mode permits a transfer pointer symbol to be displayed.

TTM TRANSFER TERMINATION MODE (B,16). A Page Print will normally terminate after transferring the character at the cursor position. This mode permits the transfer to continue to end of Page.

GAPM GUARDED AREA PRINT MODE (C,49). Areas of the Page may be designated as guarded (ie, their contents are not normally to be transferred); see Forms section. This mode permits the content of Guarded Areas to be printed.

The following modes permit Selected Areas to be printed; see Using Selected Areas below.

SATM SELECTED AREA TRANSFER MODE (B,17). Permits printing of the Active Selected Area (if SATM is reset).

MATM MULTIPLE AREA TRANSFER MODE (B,15). Permits printing of all Selected Areas in the Page (if SATM is reset).

#### USING THE TRANSFER POINTER

Page Print normally starts at the beginning of Page, and ends with the cursor (TTM reset) or end of Page (TTM set). The Ambassador provides two controls that permit the starting and ending points to be specified anywhere within the Page.

zSTP SET TRANSFER POINTER (ESC [ Pn1 ; Pn2 u). Sets the starting address of the transfer pointer to line Pn1, column Pn2. The transfer includes the character at this position. The default value is the present cursor position.

zSTE SET TRANSFER END (ESC [ Pn1 ; Pn2 z). Sets the ending address of the the transfer pointer to line Pn1, column Pn2. The transfer includes the character at this position. The default value is the present cursor position. Note: If TTM is reset (ie, transfer to cursor), if the cursor is encountered before reaching the specified endpoint, the transfer will terminate after transferring the character at the cursor. This may be avoided by setting TTM.

The pointers are restored to beginning and end of Page after each transfer.

These controls may be used by the host to print a specified region of the Page. They may be used by the operator, by typing in the controls or loading them into a programmable key. Examples:

ESC [ u

Sets the starting address to include the character at the cursor.

ESC [ z

Sets the ending address to include the character at the cursor.

ESC P ` H y ~ [ [ { U } | y ~ [ [ { Z } ESC \

Programs the above controls into PF1 and PF2, respectively. To print a portion of the Page, depress PF1 when the cursor is at the first character to be printed, and PF2 when the cursor is at the last character to be printed.

ESC [ u ESC [ z ESC [ i

This string prints the character at the cursor.

ESC [ ; 1 u ESC [ ; 80 z ESC [ i

This string prints the entire contents of the active line (ie, the line containing the cursor).

ESC [ 6 ; 1 u ESC [ 12 ; 80 z ESC [ i

This string prints the contents of lines 6 through 12 in the Page.

Note: The preceding example could also have been done using the zSDP control. The zSDP control defines the 'Page'. It partitions memory, but does not change its contents; see Display section, Definitions. The MC control transfers only the contents of the Page (TTM set). The string, ESC [ 12 ; 5 p ESC [ i, would have accomplished the same function with fewer codes (ignoring the fact that the Page still has to be restored). The transfer pointer controls are more versatile, because they permit column parameters.

## USING SELECTED AREAS

The Ambassador provides a Selected Area capability that permits the region(s) of the Page (to be printed) to be selected by visible symbols in the display. A Selected Area is defined as starting with an SSA symbol (forward-pointing triangle) and ending with an ESA-symbol (backward-pointing triangle).

The operator may enter (or insert) these symbols with the SSA and ESA keys on the Control keypad. The host enters them with the SSA and ESA controls.

SSA START OF SELECTED AREA (ESC F). Writes an SSA-symbol to the Page.

ESA END OF SELECTED AREA (ESC G). Writes an ESA-symbol to the Page.

These symbols are characters, just like any of the other graphic characters. They may be erased with erase controls, moved with edit controls, and are included in transfers exactly as any other character. When transferred to the printer, they are sent as a Space code (2/0) (not as ESC F or ESC G).

The symbols assume a control attribute only when SATM is in the reset state. In that case, they affect the transfer according to the setting of MATM.

If MATM is reset, only the active Selected Area (ie, the one containing the cursor) is transferred. If TTM is reset (ie, transfer to cursor), the transfer includes the SSA-symbol and all following text through the character at the cursor.

If MATM is set, all Selected Areas in the Page (or up to the cursor, if TTM is reset) are transmitted. The contents of each area are bracketed by SSA and ESA spaces in the transfer.

#### USING GUARDED AREAS

The Ambassador provides a Guarded Area capability that permits designated regions in the Page to be 'guarded' from transfer. The regions are designated by the host with the DAQ control; see Forms section. They are normally intended for use with Forms, but may also be used by the host simply to exclude designated regions of the Page from a printout. Example:

```
ESC [ 6 H ESC [ 1 o ESC [ 9 H ESC [ o ESC [ i
```

This string prints the contents of the Page, excluding lines 6-8.

NOTE: Selected and Guarded Areas provide alternative means of accomplishing the same result, namely selective transfer of designated regions of the Page. It is envisioned that the operator will tend to use Selected Areas (because of the visible symbols) and the host Guarded Areas. Using the two together is not recommended. Doing so will yield predictable, but not necessarily sensible, results.





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## DEFINITIONS

Certain terms are used in describing the Ambassador's Form-Filling features. They are defined below to clarify their usage. These definitions follow, and are consistent with, the ANSI definitions.

**PAGE.** The portion of Active Memory between the Upper and Lower Host Areas; see Display section. The Page is the only portion of Display Memory that may be accessed, written, or affected (by erase/edit operations) with the primary cursor. In Forms Mode, the Page is divided into Qualified Areas, which may further limit these operations in respect to Local Entry.

**QUALIFIED AREA.** A portion of the Page bounded by Area Qualifiers. An Area includes the character position at the beginning Area Qualifier and excludes the character position at the trailing Area Qualifier.

**AREA QUALIFIER.** A control attribute(s) assigned to a single character position in the Page. The attribute(s) may apply only to that position (eg, a page tab stop) or to all character positions in the Area (eg, protected). Area Qualifiers are set with the DAQ control; see Creating a Form, below.

**FORMS MODE.** The terminal is said to be in Forms Mode when any Area Qualifier has been set within the Page.

**NOTE:** The significance of Forms Mode is that the user, by setting a control attribute at a specified character position within the Page, conceives of the Page as a page, rather than as a scrolling window into the host.

**LOCAL ENTRY.** Operator entry while the terminal is in Monitor SRM. The keyboard inputs are not sent to the host as they are keyed. They are, instead, displayed and executed locally, and the resultant display subsequently sent to the host as a block. Local Entry uses only the primary cursor, regardless of the setting of ZACM.

**FIELD.** A portion of the Page bounded by tab stops. A Field contains the character position at the beginning tab stop and excludes the character position at the trailing tab stop. In Forms Mode, the tab stops are page

tab stops; see Cursor Controls, Using Page Tabs. Page tab stops are also Area Qualifiers. A Field contains at least one, and possibly more, Qualified Areas (eg, an unprotected and a protected Area).

NOTE: This differs from the common definition of 'field' (as a protected, followed by unprotected, region). We have adhered to the ANSI definition.

ACTIVE. Applied to a portion of the Page, refers to the portion that contains the cursor, eg, the Active Area is that Area that presently contains the cursor.

#### MODES THAT AFFECT FORM-FILLING

The following modes affect form-filling. Their settings can be reviewed, and changed as desired, on the Setup lines; see Setup section. The Setup line letter, and mode number, are shown in parentheses following the name. Detailed descriptions of these modes can be found in the Appendix.

TSM TABULATION STOP MODE (D,18). Determines whether columnar tab stops (TSM reset) or page tab stops (TSM set) are affected by the Tab Set/Clear controls.

ERM ERASURE MODE (D,6). Permits the erasure of characters regardless of their protected status.

ZAKDM AUTO KEYBOARD DISABLE MODE (B,46). Upon completion of a transmission, the keyboard is automatically re-enabled (and the cursor symbol returns). This mode permits the keyboard to remain disabled, until purposefully released by the host with an EMI control.

ZHAM HOLD IN AREA MODE (A,48). In normal entry, when an Area is filled, the cursor auto-skips to the next Area. This mode permits the cursor to remain in the Area, until purposefully advanced with the TAB key.

#### CREATING A FORM

Forms are created with the DAQ control.

DAQ DEFINE AREA QUALIFICATION (ESC [ > Ps..Ps o). Sets an Area Qualifier at the present cursor position, assigning one or more control attributes to the position according to the selective parameters:

PAGE TAB STOP (Ps= 7). Sets a page tab stop at the beginning of the Area. The tab stop is active in respect to entries from the host, as well as Local Entry.

PROTECTED/GUARDED (Ps= 1). Local Entry is not permitted into the Area, AND the contents of the Area will not be included in transmissions to the host (if GATM is reset) or in transfers to the printer (if zGAPM is reset).

PROTECTED/UNGUARDED (Ps= 8). Local Entry is not permitted into the

Area, but the contents of the Area are included in transmissions to the host and transfers to the printer, regardless of the settings of GATM and zGAPM.

UNPROTECTED (Ps= 0). Local Entry is permitted into the Area.

NUMERIC ONLY (Ps= 3). Local Entry is permitted into the Area, but restricted to numerics and punctuation only (codes 2/0 (Sp) to 3/15 (?) inclusive).

RIGHT JUSTIFY (Ps= 5). Local Entry is permitted into the Area, but is right justified when leaving the Area with the TAB key (ie, the entry is shifted right until a non-Space character occupies the last character position in the Area).

CONCEALED (Ps= 18). Local Entry is permitted into the Area, but is displayed only as 'white' Spaces.

Note that the attributes that restrict entry apply only to operator entries in an off-line (ie, Monitor SRM) situation. In that situation, the entry control functions must be accomplished in the terminal (because the host is not involved in the entry). In an on-line (ie, Simultaneous SRM) situation, the entry control functions are better accomplished in the host software.

The DAQ control is not the only control that can create a Form (and put the terminal into Forms Mode). The following controls are not as versatile as DAQ, but are more code efficient and may achieve the same effect in special situations:

SPA START OF PROTECTED AREA (ESC V). Same as DAQ control, ESC [ 1 o.

EPA END OF PROTECTED AREA (ESC W). Same as DAQ control, ESC [ 7 o.

HTS HORIZONTAL TAB SET (ESC H). Same as DAQ control, ESC [ 7 o (if TSM is set).

#### EXAMPLE FORM

This example sets up a one-line Form. A diagram of the Form is shown, followed by the string that creates it. This example will be used later to illustrate the entry of data into the Form, and the sending and printing of the entered data.

In the diagram of the Form (following), the numbers are column numbers across the line. The entry 'FORM#1' is in a Protected/Unguarded area. The operator cannot change it, but it will be included in transmissions to the host. The other entries in upper-case are in Protected/Guarded areas. They are likewise protected from the operator, but will not normally be included in transmissions to the host. The lower-case letters show the Unprotected areas, a lower-case 'a' indicating alphanumeric, and lower-case 'n' indicating Numeric-only. The unprotected area following WAGE is a Right-Justify area. The unprotected area following CODE is a Concealed area. The unprotected area following NOTES extends to end of Page. All protected areas will be displayed with a Reverse rendition. The symbol 'T' indicates the location of page tab

stops.

The string that creates the Form is broken into multiple lines for clarity and ease of annotation (ie, new-line codes should not be included in the string). The spaces shown between characters are also for clarity (and should not be included, except as specifically called for with the designation, Sp). ESC denotes the ESC-code (1/11).

Form:

```

          1          2          3          4          5          6
1234567890123456789012345678901234567890123456789012345678
FORM 1 NAME aaaaaaaaaaaa AGE nn WAGE nnnn.nn CODE aaaaaa NOTES aaa...
          T          T          T          T          T

```

String:

```

ESC [ 7 m          -Sets the GR-register to Reverse rendition
ESC [ H           -Moves the cursor Home
ESC [ 8 o         -Starts a protected/unguarded Area
FORM#1           -Writes 'FORM#1' into the Area
ESC [ 1 o         -Starts a protected/guarded Area
SpNAME$         -Writes ' NAME ' into the Area
ESC [ 7 o         -Sets a page tab stop and starts an unprotected Area
ESC [ 26 `        -Moves the cursor to column 26
ESC [ 1 o         -Starts a protected/guarded Area
SpAGE$          -Writes ' AGE ' into the Area
ESC [ 7 ; 3 o     -Sets a page tab stop and starts a Numeric-only Area
ESC [ 33 `        -Moves the cursor to column 33
ESC [ 1 o         -Starts a protected/guarded Area
SpWAGE$         -Writes ' WAGE ' into the Area
ESC [ 7 ; 3 ; 5 o -Sets a page tab stop, starts a Numeric/Justify Area
ESC [ 46 `        -Moves the cursor to column 46
ESC [ 1 o         -Starts a protected/guarded Area
SpCODE$         -Writes ' CODE ' into the Area
ESC [ 7 ; 18 o    -Sets a page tab stop and starts a Concealed Area
ESC [ 58 `        -Moves the cursor to column 58
ESC [ 1 o         -Starts a protected/guarded Area
SpNOTES$        -Writes ' NOTES ' into the Area
ESC [ 7 o         -Sets a page tab stop and starts an unprotected Area

```

EDITING THE FORM

The control attributes (ie, Area Qualifiers) are not stored in the Page (with the characters and their visual attributes) but are, instead, stored separately, as a control table, indexed by character position. This not only permits the Form to be rapidly written when needed, it is also efficient when entering data into the Form, and when sending or printing data from it.

It has the added advantage of clearly separating the visual and control attributes. The person creating the Form may freely associate these attributes in any way that best accomplishes the task at hand (including no association, or different associations in different parts of the Form). The rendition of pro-

ected parts of the Form is controlled when the Form is written. The rendition of the unprotected parts of the Form is controlled by the setting of the GR-register when the unprotected areas are erased. The rendition of the operator's entries is controlled by the setting of the GR-register during the entry.

Thus, a 'Form' exists in the terminal only by virtue of a table of Area Qualifiers vs. character position. The significance of Forms Mode, is that it causes the Display Processor to reference the table as part of processing an input. If the input is a local keyboard entry (ie, from the keystroke buffer; see Entering Data into the Form), the Display Processor references the table for each entry. If the input is received from the host (ie, from the FIFO buffer), the Display Processor references the table only when it receives one of the tab controls (HT, CHT, CBT, or HTJ).

The Area Qualifier (AQ) table contains up to 320 Area Qualifiers. This is the only factor that limits the complexity of the Form that can be created; there are no limits on number of qualifiers per line, spacing between qualifiers, etc.

The AQ table may be edited in various ways:

**CHANGING AN ENTRY IN THE AQ TABLE.** An entry may be changed by first positioning the cursor to the Area Qualifier (ie, to the first character position of the Area).

A DAQ control may be used to change the Area Qualifier in accordance with new parameters. (This is likewise true of the SPA and EPA controls.)

A set-tab control, HTS (ESC H) or CTC (ESC [ W), may be used to add a tab stop to the Area Qualifier. A clear-tab control, TBC (ESC [ g) or CTC (ESC [ 2 W), may be used remove a tab stop from the Area Qualifier. A clear-all-tabs-in-line control, TBC (ESC [ 2 g) or CTC (ESC [ 4 W), may be used to remove tab stops from all Area Qualifiers in the Active line. A clear-all-tabs control, TBC (ESC [ 3 g) or CTC (ESC [ 5 W), may be used to remove tab stops from all Area Qualifiers. In all cases, the tab stops are added or removed without changing any of the other control attributes of the Area Qualifier.

Whenever a tab stop is removed, the remaining attributes of the Area Qualifier are compared with the attributes of the preceding Area Qualifier. If they are the same (or the same except for a tab stop in the preceding qualifier), the entry is deleted (ie, the preceding Area is extended to encompass the present Area).

**INSERTING AN ENTRY INTO THE AQ TABLE.** An entry may be inserted into (or added to) the table, by first positioning the cursor to the desired position (that does not presently contain an Area Qualifier, ie, any position other than the first character position of an existing Area).

A DAQ control inserts an Area Qualifier with the attributes specified by its parameters. An SPA control inserts an Area Qualifier with a 'protected' attribute only. An EPA control inserts an Area Qualifier with 'unprotected' and tab stop attributes. An HTS (ESC H) or CTC (ESC [ W) control inserts an Area Qualifier having the same attributes as the preceding Area Qualifier, with a tab stop attribute added.

When an entry is inserted into the table, no comparison is made with adjacent entries. Adjacent Areas with identical attributes may be written (or inserted), if desired.

DELETING AN ENTRY FROM THE AQ TABLE. Entries may be deleted from the table by erasing the region containing the entries, with ERM (Erasure Mode) set.

An ECH (ESC [ X) control deletes the Area Qualifier at the cursor position, if any. An EA (ESC [ 2 O) control deletes the Area Qualifier associated with the Active Area. An EF (ESC [ 2 N) control deletes all Area Qualifiers in the Active Field. An EL (ESC [ 2 K) control deletes all Area Qualifiers in the Active Line. An ED (ESC [ 2 J) control deletes all Area Qualifiers.

An entry may also become deleted by virtue of removing a tab stop; see Changing an Entry in the AQ Table, above.

REMOVING THE FORM. Simply deleting the last Area Qualifier in the Page does not remove a Form (ie, reset Forms Mode). One of the following explicit controls is required to remove the Form.

A full-Page erase (ESC [ 2 J or ESC [ H ESC [ J) with ERM set, or an RIS (ESC c) control, removes the Form and erases the Page.

A zSDP (ESC [ Pn..Pn p) control removes the Form without erasing the Page.

#### INITIALIZING THE FORM

The host writes the Form to the terminal by sending the necessary string; see Example Form, above. This may be done in either Simultaneous or Monitor SRM. (The host retains full control of the terminal, including the ability to write to the display, in Monitor SRM.) If done in Monitor SRM, the keyboard should first be disabled (so that inadvertent operator entries are not interspersed), and re-enabled only after the form has been written, and the terminal initialized for operator entry.

The following is a typical string for initializing the Form in Simultaneous SRM:

Form string	-Writes the Form
ESC [ m	-Sets GR-register to Normal rendition
ESC [ 2 J	-Erases all unprotected Areas
ESC [ > 36 h	-Sets Page mode (to inhibit memory scroll)
ESC [ 12 l	-Puts the terminal into Monitor SRM

Note: The Form initialization string will typically include other controls to tailor the operator's keyboard (and the various modes) to the application. These are discussed in the appropriate sections below.

The terminal is now in Monitor SRM, and the operator may locally enter data to the Form. The terminal's FIFO is not being used by the operator. It may be used by the host to write into the Host Areas or Inactive Memory with the Alternate cursor; see Display section. This is a totally parallel operation and does not interfere, in any way, with the operator's entry, (eg, the host could maintain a real-time clock in the Host Area, without interrupting or slowing

down the operator.) The host may also write into the operator's Page, if desired, but should use the DMI/EMI controls to disable/enable the the operator's keyboard to avoid any possibility of conflict. The host may also use the terminal's FIFO to print (while the operator is entering data) using the zSRC (Remote Copy) control; see Printer section.

NOTE: The Form itself may be written with the Alternate cursor (eg, to set page tab stops in the Host Areas and Inactive Memory for the host's use). Keep in mind, however, that the line numbers referenced by the Alternate cursor differ from those referenced by the Primary cursor, if an Upper Host Area is used; see Display section, Using the Alternate Cursor.

#### ENTERING DATA INTO THE FORM

The operator's input is processed one keystroke at a time; escape and control sequences are not assembled. Thus the operator cannot type in undesired sequences. (For example, if the operator types the ESC key, an ESC-code is processed, which does nothing. If the operator follows it with a graphic character, the character is processed and written to the screen.) The system programmer can provide the operator with any sequences of controls that are desired for the application, by loading them into Programmable keys as part of the Form initialization string.

Similarly, if there are terminal control keys that the system programmer wishes to deny to the operator (such as RESET, SETUP, BREAK, etc.), these keys may be disabled by loading them with null in the Form initialization string. Example:

```
ESC P ` & | | | ESC \  
Disables the RESET, SETUP, and BREAK keys.
```

The operation of the terminal control keys, if not re-programmed, is described in the Keyboard section. The keys operate the same in Forms Mode, with the following exceptions:

Local cursor controls are restricted to unprotected areas. If the cursor is moved into a protected area, it will auto-skip right to the first unprotected character position.

Local tab set/clear controls are ignored.

Local erase controls (EA, EF, EL) are constrained to erase only in the Active Area, regardless of the control used. A Local ED control is constrained to erase only unprotected areas, regardless of the setting of ERM.

Local edit controls are constrained to edit only in the Active area, regardless of the setting of SEE.

These exceptions apply to all terminal controls entered from the keyboard during Local Entry, regardless of whether they are the original or re-programmed strings, and regardless of what keys generate them.

The operator will typically use the TAB key to move about the Form. If the Form contains tab stops at the beginning of unprotected Areas, TAB moves the cursor right to the beginning of the next unprotected Area. SHIFT-TAB moves the cursor left to the beginning of the preceding unprotected Area (if the cursor is at the beginning of the Active Area) or to the beginning of the Active Area (otherwise). Attempting to tab past the last unprotected Area (or backtab past the first unprotected Area) results in an error 'beep'.

During operator entry, zHAM (Hold in Area Mode) controls what happens when the operator writes into the last character position of an Area. If zHAM is reset, the cursor auto-skips to the beginning of the next unprotected Area. If zHAM is set, the cursor remains at that position until the TAB key is used to leave the Area.

If the operator attempts to write an alpha character into a Numeric-only area (such as AGE and WAGE in the Example Form), an error 'beep' results. When the operator terminates entry into a Right-Justify area (such as WAGE in the Example Form), with the TAB key, the entry moves right to the end of the area. When the operator writes into a Concealed area (such as CODE in the Example Form), the characters are not displayed (but 'white' Spaces are displayed instead, as markers).

The operator may correct an error before leaving an Area, or backtab to the Area to correct it. An entry (or part of it) may be erased with the Spacebar, with BACKSPACE (if zDBM is set), or with the ERASE key. An entry may be edited with the EDIT, INSERT, and DELETE keys. In all cases, only the Active Area is affected.

#### SENDING THE ENTERED DATA

When the entered data are ready to transmit, the operator depresses the SEND key. This disables the keyboard, and sends the data to the host. The keyboard is automatically re-enabled upon completion of the transmission, unless zAKDM (Auto Keyboard Disable Mode) is set, whereupon it remains disabled until purposefully re-enabled by the host (eg, with the EMI control, ESC b). This permits the host to 'protect' the displayed data (from operator actions) until it has performed whatever validity checks are desired.

The operation of the Send controls and modes is described in the Send Controls section. Their operation is the same in Forms Mode. Examples:

The format of the Example Form was:

```
FORM 1 NAME aaaaaaaaaaaa AGE nn WAGE nnnn.nn CODE aaaaaa NOTES aaa...
```

Assume that it was filled out by the operator as shown below, the symbol '-' being used to represent an unprotected Space. (Note: The characters shown in the Area following CODE are the characters entered, not displayed. The characters, A789, are displayed as 'white' spaces; the two characters that follow them are displayed as 'black' spaces.)

```
FORM#1 NAME John Doe----- AGE 37 WAGE --12.34 CODE A789-- NOTES None
```

In the examples below, spaces are shown between the transmitted characters for



clarity; they are not part of the transmission. The symbol '-' is used to show the transmission of a Space (2/0) from an unguarded character position. The symbol '+' is used to show the transmission of a Space (2/0) from a guarded position.

With the Transfer modes, FETM, GATM, zFSTM, and zGRTM reset, the content of the transmission is shown below. NL indicates a new-line code, as selected by LNM: CR LF (if LNM is reset) or LF (if LNM is set). An NL is included in the transmission at the end of every line (including partial lines) in the transmitted region, regardless of whether the line contains data, is guarded, etc. The present example assumes that TTM is reset (ie, transmit to cursor) and that the cursor is in the top line (following the data).

```
F O R M # 1 J o h n - D o e - - - - - 3 7 - - 1 2 . 3 4 A 7 8 9 - - N o n
e NL
```

Setting FETM causes the new-line codes to be NOT included in the transmission:

```
F O R M # 1 J o h n b D o e - - - - - 3 7 - - 1 2 . 3 4 A 7 8 9 - - N o n
e
```

Setting GATM causes all Areas (including those designated as Guarded) to be included in the transmission:

```
F O R M # 1 + N A M E + J o h n - D o e - - - - - + A G E + 3 7 + W A G E
+ - - 1 2 . 3 4 + C O D E + A 7 8 9 - - + N O T E S + N o n e NL
```

Setting zFSTM causes trailing Spaces to be suppressed (and HT codes inserted to mark their omission) in the transmission:

```
F O R M # 1 HT J o h n - D o e HT 3 7 HT - - 1 2 . 3 4 HT A 7 8 9 HT NL
```

Setting zGRTM causes Graphic Rendition information (in the form of SGR controls) to be included in the transmission: (Note: In this example, GATM is also set, so as to illustrate multiple rendition changes. It also illustrates how a Form could be created and edited by the operator on the screen, the host software translating the SGR controls into the appropriate DAQ controls in a prescribed manner.)

```
ESC [ 7 m F O R M # 1 + N A M E + ESC [ m J o h n - D o e - - - - - ESC [
7 m + A G E + ESC [ m 3 7 ESC [ 7 m + W A G E + ESC [ m - - 1 2 . 3 4 ESC
[ 7 m + C O D E + ESC [ m A 7 8 9 - - ESC [ 7 m + N O T E S + ESC [ m N o
n e NL
```

The preceding examples assumed that no Header/Trailer strings were programmed. If they had been, the Header string would have preceded the transmission shown, and the Trailer string would have followed it. These strings may be used to bracket the transmissions with control codes or data needed, or desired, by the host.

#### CORRECTING AND RE-SENDING

If the host does validity checking of the transmitted data, zAKDM should be set (to 'protect' the displayed data from inadvertent operator actions until

the validity checks are completed).

If there was an error in the transmission of the data, the host may send the STS (ESC S) control to re-transmit the data.

If there was an error in the entry of the data, the host, if desired, may use the zGUA control, so that after correction, only the corrected data are included in the re-transmission.

zGUA GUARD UNPROTECTED AREAS (ESC :). Causes all unprotected Areas in the Page to become guarded. Thereafter, any operator entry into an Area causes that Area to become unguarded.

Example: In the zFSTM example above, the transmission was:

```
F O R M # 1 HT J o h n - D o e HT 3 7 HT - - 1 2 . 3 4 HT A 7 8 9 HT NL
```

Suppose that the actual transmission contained 97, in the AGE Area (instead of 37), and that the host finds that to be an invalid entry:

```
F O R M # 1 HT J o h n - D o e HT 9 7 HT - - 1 2 . 3 4 HT A 7 8 9 HT NL
```

The host must inform the operator that there is an error, and where. This may be done via a Host Area; however, it may also be done with the following string:

```
ESC [ 5 m      -Sets the GR-register to Blinking
HT             -Moves the cursor to the next tab stop (the error Area)
ESC 9         -Causes the 97 to blink
ESC [ m      -Restores the GR-register to Normal
ESC :         -Guards all unprotected Areas
ESC b        -Re-enables the keyboard
```

The operator now sees a blinking Area on the screen and knows (by pre-arrangement) to correct it. As the operator overwrites the entry, it stops blinking (because the GR-register was restored to Normal). When the operator depresses the SEND key, the resulting transmission will contain:

```
F O R M # 1 HT HT 3 7 HT HT HT NL
```

If the host accepts the corrected entry as valid, it may re-initialize the Form (for the next set of entries) as follows:

```
ESC [ 6 l      -Resets ERM (erase unprotected)
ESC [ 2 J      -Erases the Page
ESC b        -Re-enables the keyboard
```

Erasing the Page indicates to the operator (by pre-arrangement) that the host is ready for a new set of entries. It also restores any guarded unprotected Areas to unguarded.

In the last string, the Reset ERM control may be omitted if the host resets ERM in the Form initialization string, and leaves it reset,

In the preceding string, if the host had used the Alternate cursor to send the

string, there would have been no need to set and restore the GR-register. The Alternate cursor has its own GR-register, which could have been preset to Blinking in the Form initialization string. (That would result in erasing the screen to blinking Spaces, but that is not discernible to the operator, nor to the host (unless zGRTM is used).

PRINTING THE ENTERED DATA

The operation of the Print controls and modes is described in the Printer section. Their operation is the same in Forms Mode.

In a data entry situation, printing will normally be done by the host, using Remote Copy, during the periods while the operator is entering data; see Initializing the Form, above.

The Form may also be used, with Page Print, simply to obtain a formatted printout. Using the example entry again (the symbol '-' still being used to represent an unprotected Space):

FORM#1 NAME John Doe----- AGE 37 WAGE --12.34 CODE A789-- NOTES None

In the examples below, spaces are shown between the transferred characters for clarity; they are not part of the transfer. The symbol '-' is used to show the transfer of a Space (2/0) from an unguarded character position. The symbol '+' is used to show the transfer of a Space (2/0) from a guarded position.

With zGAPM reset, the characters in guarded Areas are transferred as Spaces. The transfer to the printer is illustrated below. NL indicates a new-line code, as selected by the setting in Setup line C: CR, LF, or CR LF. An NL is included in the transfer at the end of every line (including partial lines) in the transferred region, regardless of whether the line contains data, is guarded, etc. The present example assumes that TTM is reset (ie, transfer to cursor) and that the cursor is in the top line (following the data).

F O R M # 1 + + + + + J o h n - D o e - - - - - + + + + + 3 7 + + + + +  
+ - - 1 2 . 3 4 + + + + + A 7 8 9 - - + + + + + N o n e NL

With zGAPM set, all characters are transferred, regardless of their guarded status. The transfer to the printer is illustrated below.

F O R M # 1 + N A M E + J o h n - D o e - - - - - + A G E + 3 7 + W A G E  
+ - - 1 2 . 3 4 + C O D E + A 7 8 9 - - + N O T E S + N o n e NL

Given a Form, eg, a Telephone Contact report with protected headings like Name, Company, Subject, Action Required, etc, the data would probably be printed with zGAPM set (so that both the data and the headings are printed). However, if the Form (in the terminal) matched a pre-printed Form (on the printer), eg, an Invoice form, the data would probably be printed with zGAPM reset (so that only the data are printed). The headings on the terminal's Form would be transferred as Spaces, merely spacing over the pre-printed headings on the printer's Form.



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## PROGRAMMABLE FEATURES

The Ambassador provides the following programmable string capabilities:

60 Programmable Key strings. These strings contain codes that are transmitted to the host (or executed locally) when one of the keys is typed. They have default values at power-on (see Table III) which may be changed by the user with the DCS control (see below).

4 Programmable Operational strings. These strings contain codes that are transmitted to the host when certain events take place (eg, start of transmission, receipt of an ENQ from the host, etc.). They have default values at power-on (see Table II) which may be changed by the user with the DCS control.

A Programmable non-volatile Power-on string. This string may be loaded by the user (again with the DCS control) with codes to be executed by the terminal each time it is powered on.

## DEVICE CONTROL STRINGS

The terminal control DCS (ESC P) is used to load the programmable strings. The Ambassador recognizes characters following this control as programming instructions to the terminal.

These programming instructions consist of a series of one or more string table entries. Each entry indexes to one of the programmable strings and loads it with the character codes that follow. These characters then become the string that is transmitted when a programmable key is depressed, or an operational string is activated.

Since DCS controls are normally sent from a host program to the Ambassador for execution, the commands are designed to facilitate programmatic control of the programmable strings. However, a terminal operator may also make use of the DCS control by placing the Ambassador into Local Test Mode (Setup T) and manu-

ally keying in the control sequences.

#### OPERATIONAL STRINGS

The Ambassador provides the following operational strings. The strings can be loaded, changed, and disabled with the DCS (ESC P) control.

**HEADER.** The Header string precedes all transmissions from the terminal's Display Memory to the host. It is initialized to null (ie, no codes) at power-on.

**TRAILER.** The Trailer string follows all transmissions from the terminal's Display Memory to the host. If a transmission is aborted, the trailer is still sent. It is initialized to null at power-on.

**ENQ.** The ENQ string is sent in response to a received ENQ (O/5) code. It is initialized to null at power-on.

**DA.** The DA string is sent in response to a received DA (ESC [ c) control. It is initialized at power-on with the release-revision-options number of the terminal's firmware.

#### POWER-ON STRING

The Ambassador provides a Power-on string that permits a string of controls to be loaded into non-volatile (ie, permanent) memory, to be automatically executed each time the terminal is powered-on. This string may be used to initialize the terminal to a desired state, eg, to initialize key codes, tab stop positions, or screen format, or just to display initial instructions; see Power-on Examples, below.

There may be occasions when the operator wishes to initialize the terminal without executing the Power-on string. This may be done by holding down the RESET key as the terminal is powered-on.

#### KEY STRINGS

The remainder of the programmable strings are Key strings. These are loaded at power-on with default strings (see Keyboard section), but may be re-programmed by the user with the DCS control.

When a programmed key is typed, the loaded string is generated exactly as with any other key. In Simultaneous SRM, it is sent to the host (which may or may not echo it back). In Monitor SRM, it is executed locally.

The programmable keys are listed in Table III. Note that some of the keys control two strings -- one when unshifted, another when shifted. Any of these keys may be re-programmed, or disabled, or programmed to a different key position. They may be returned to their initial state, after having been changed or disabled, by using the DCS control to re-load them with their default strings.

## PROGRAMMING THE STRINGS

The DCS control to program the Operational and Key strings begins with the codes 1/11 5/0 (ESC P) followed by the code 6/0 (`) to identify the start of a string table entry. (The DCS control to program the Power-on string uses the code 7/0 (p), instead of the code 6/0 (`), to identify the start of its string entry; see Power-on Examples, below.)

The first character in a string table entry is the index (address) of the string to be programmed. The indices are codes in the range 2/0 (Sp) to 5/15 (\_\_) and are listed in Tables II and III. (No index is required in programming the Power-on string.)

Immediately following the index is the data portion of the string table entry. This is the actual character string that is assigned as a result of the DCS command. Characters in the data portion are limited (basically) to ASCII codes in the range 2/0 (Sp) to 5/15 (\_\_) inclusive. To allow the user to include characters from the full range of ASCII codes (0/0 to 7/15), the Ambassador also recognizes certain control codes and delimiters; see Table I.

To allow for the inclusion of ASCII codes in the range 0/0 to 1/15, the code 7/14 (~), appearing in the data portion of a string table entry, is interpreted by the Ambassador as a non-latching control shift, and causes the next code, which should be in the range 4/0 (@) to 5/15 (\_\_), to be interpreted as a code in the range 0/0 (NUL) to 1/15 (US). (Referring to the ASCII code table in the Appendix -- The control-shift forces b6 and b7 to zero. Thus codes beginning with a '4' are interpreted as beginning with a '0', and those beginning with a '5' are interpreted as beginning with a '1').

To allow for the inclusion of ASCII codes in the range 6/0 to 7/15, the code 7/11 ({}), appearing in the data portion of a string table entry, is interpreted by the Ambassador as a latching lower-case shift, and causes the following codes, which should be in the range 4/0 (@) to 5/15 (\_\_), to be interpreted as codes in the range 6/0 (`) to 7/15 (DEL). The code 7/13 (}) terminates the lower-case shift. (Referring to the ASCII code table in the Appendix -- The lower-case shift forces b6 to one. Thus, codes beginning with a '4' are interpreted as beginning with a '6', and codes beginning with a '5' are interpreted as beginning with a '7').

The end of a string table entry is determined by the start of another entry, or by the ST (ESC \) control.

Another entry may be started by the code 6/0 (`) followed by an index to the next string to be programmed. Alternatively, if the next string to be programmed is the next (sequential) string, the code 7/12 (|) may be used alone. (The code 7/12 increments the index).

For Key strings, there are three other (control) codes, that may be used at the beginning of the data portion of a string table entry, that affect what happens when the key is typed.

The code 7/8 (x) may be used to set a 'repeat' flag for the key. This will cause its programmed string to be generated repeatedly while the key is held down. If used, this code should be the first character of the data portion of the entry (ie, immediately following the index for the string). Note: Keys

programmed to 'repeat' will repeat regardless of the setting of zKRM. The repeat rate is controlled by zFRM.

The code 7/9 (y) may be used (following the 'x' if used) to tag the key as 'Local only'. This will cause its programmed string to be executed locally in both Simultaneous and Monitor SRM when the key is typed.

The code 7/10 (z) may be used (following the 'x' if used) to tag the key as 'Transmit only'. This will cause the programmed string to be sent to the host in both Simultaneous and Monitor SRM when the key is typed.

#### DISABLING A STRING

If a string is addressed (ie, its index given) and no characters are given in the data portion of the entry, the string is disabled.

#### DCS EXAMPLES

The following examples may be entered locally by going into Local Test (by typing the 2-key sequence SETUP T), and then typing in the example strings. The entry may be observed on the Monitor line as it is typed. ESC denotes the ESC-key, and is shown on the Monitor line as a reverse left-bracket ([).

The spaces shown between characters are for clarity (and should not be included in the string). Likewise, some strings are broken into multiple lines for purpose of annotation (and the new-lines should not be included in the string).

```
ESC P ` H H E L L O ESC \
```

This DCS sequence loads PF1 with the string, HELLO, ie, the word, HELLO, is generated each time the PF1 key is typed. The grave-accent (`) following the P is the character under the tilde (~) on the keyboard. The components of this string are as follows:

ESC P	-Start of a DCS string
`	-Start of a string table entry
H	-Index to the PF1 key
HELLO	-Data portion of the string table entry
ESC \	-String terminator to end the DCS string

```
ESC P ` H x H E L L O ESC \
```

This DCS sequence also loads PF1 with the string, HELLO. Now, since we have included the x-parameter, the key will repeat while it is held down.

```
ESC P ` I x H { E L L O } ESC \
```

This DCS causes PF2 to generate the word, Hello, in upper/lower-case. The x causes the key to repeat while held down. The braces ({..}) cause the enclosed characters to be translated to lower-case.

```
ESC P ` > | | | | | | ESC \
```

This DCS disables the ERASE, EDIT, DELETE, and INSERT keys. The greater-than (>) indexes to the ERASE key in the unshifted mode. Each vertical bar (|) indexes to the next sequential string (ie, the ERASE key shifted,



the Edit key, etc; see Table III.) Since the data portion of all the entries is empty, the keys are disabled.

```
ESC P ` J x * ~ [ D | x # ~ [ M ESC \
```

This DCS causes the PF3 key to generate a descending diagonal of asterisks, and the PF4 key to generate an ascending diagonal of pound signs. The tilde (~) causes the left-bracket ([) to be interpreted as CTRL [, or ESC. PF3 is loaded with the string, \* ESC D. ESC D is the IND (Index) control. PF4 is loaded with the string, # ESC M. ESC M is the RI (Reverse Index) control. The components of this string are as follows:

```
ESC P          -Start of DCS
`              -Start of string table entry
J              -Index to PF3 key
x              -Repeat code for PF3
*~[D          -Data for PF3 table entry
|              -Index to next string (ie, PF4)
x              -Repeat code for PF4
#~[M          -Data for PF4 table entry
ESC \         -ST control to end DCS
```

#### POWER-ON EXAMPLES

The Power-on string is loaded using a DCS control similar to that used to load the Operational and Key strings, except that the code 7/0 (p) is used to identify the start of the string (instead of 6/0), and no indices are required. All DCS coding restrictions apply.

Like the DCS examples above, these examples may be entered locally by going into Local Test (by typing the 2-key sequence SETUP T), and then typing in the example strings. The entry may be observed on the Monitor line as it is typed. ESC denotes the ESC-key, and is shown on the Monitor line as a reverse left-bracket ([).

The spaces shown between characters are for clarity (and should not be included in the string). Likewise, some strings are broken into multiple lines for purpose of annotation (and the new-lines should not be included in the string).

The string may be executed (to demonstrate its results) without having to power down, by depressing CTRL-SHIFT-RESET (or just RESET, if the terminal is in Local Test). The string is executed if the RESET key is just momentarily typed; it is not if the RESET key is held down; see Diagnostics section.

```
ESC P p H E L L O ESC \
```

This DCS loads the Power-on string with the message 'HELLO'. Each time the terminal is powered on, this message will be displayed on the screen. The components of the string are as follows:

```
ESC P          -Start of DCS
p              -Specifies the Power-on string
HELLO         -Characters to be executed
ESC \         -ST control to end the DCS
```

```
ESC P p ~ [ P { @ } H H E L L O ~ [ \ ESC \
```

This DCS loads the Power-on string with the DCS string, ESC P ` H H E L L O ESC \, which when executed, will program the PF1 key to generate the word, HELLO; see the first DCS example, above. Note that, because of the DCS coding restrictions, the ESC's in this string must be loaded as a tilde left-bracket (~[]), and the lower-case grave-accent (`) must be loaded as {@}. The components of the string are as follows:

ESC P p	-DCS to load Power-on string
~[P{@}HHELLO~[\	-String to be executed
ESC \	-ST control to end

```
ESC P p ~ [ [ 2 4 ; ; ; 2 4 { P } ESC \
```

This DCS loads the Power-on string with the zSDP (Set Display Parameters) control, ESC [ 2 4 ; ; ; 2 4 p, which when executed, sets the Display Memory and Screen size of the terminal to 24 lines. Note that, because of the DCS coding restrictions, the ESC must be loaded as a tilde left-bracket (~[]), and the lower-case p must be loaded as {P}.

```
ESC P p
  H E L L O
  ~ [ P { @ } H H E L L O ~ [ \
  ~ [ [ 2 4 ; ; ; 2 4 { P }
ESC \
```

The Power-on string may be programmed to perform more than one function. In this example, the DCS programs the Power-on string to perform all of the functions of the three previous examples. The only limitation to the number of functions that may be programmed into the string is the size of the non-volatile memory; see Size Limitations, below.

## SIZE LIMITATIONS

There is a size limitation on the total length of the programmable strings that may be stored by the Ambassador. For the 4 Operational strings and the 60 Key strings, the total memory allotment is 320 bytes.

Before the contents of a DCS string are stored in memory, its control and delimiter characters are executed and stripped from the data portion of the strings to be stored. Controls and delimiters in the range 6/0 (`) to 7/14 (~) do not take up space in memory, nor does the index which follows the 6/0 code. Characters affected by the control shift (~) and lower-case shift ({} specifications are stored as their actual ASCII representation. The repeat, local, and transmit (x, y, z) specifications are flagged in the control byte for the string.

The length of a string in memory is the number of ASCII characters represented by the data portion of its string table entry. For example, consider the DCS string used to program the PF1 key to repeat the characters, Hello -- ESC P ` H x H { E L L O } ESC \. After executing this DCS, the Ambassador will have assigned 5 bytes of memory to the PF1 key -- one for each of the characters, Hello.

The Operational and Key strings are stored in memory sequentially, the Operational strings first, in the order specified in Tables II and III.

The default strings shown in the tables do not initially require string table space (rather they are encoded as pointers in the control byte). If they are re-programmed, even if re-programmed to their default values, they do take up table space, until the terminal is re-initialized (by power-on or Setup Z); see Diagnostics section.

The Power-on string has its own 255-byte non-volatile memory. This count applies only to the characters actually executed at power-on. As with the Operational and Key strings, the codes 6/0 (`) to 7/14 (~) (in the DCS which loads the memory) do not take up space in the memory.

CAUTION: At each power-on, the Power-on string is copied into the terminal's input buffer for execution. If the Power-on string is near its maximum length of 255 characters, extra input from the host (such as a power-on log-in message), may cause the buffer to overflow, and the string will not execute. If this occurs, the Power-on string may always be executed by typing the two-key sequence, SETUP Z; see Diagnostics section.

#### DCS SPECIAL NOTES

1. The key positions labeled RESET, BREAK, and SETUP are not affected by the mode KAM (Keyboard Action Mode) or the controls DMI/EMI (Disable/Enable Manual Input). These keys may be disabled only by loading them with a null string with the DCS control.
2. The key position labeled SETUP may be disabled and re-enabled with the DCS control, but its function may not be moved to a different key position. (It is the position of the Setup key, and not its code, that is significant in exiting from Setup. This is likewise true of all other Setup exits.)
3. The key positions labeled RETURN and ENTER, if re-programmed, are no longer affected by zRLM (Return Key CRLF Mode), even if returned to their default value, until the terminal is re-initialized (by power-on or SETUP Z).
4. A key may be programmed to include a DCS to re-program a string of higher index (ie, one occurring later in the string table; see Table III), but not one of lower index. For example, PF1 may be programmed to re-program PF2, but no key may be programmed to re-program an Operational string.
5. NUL-codes (0/0) cannot be loaded into the Power-on string.

T A B L E I : CONTROLS AND DELIMITERS

CHAR	CODE	USAGE
`	6/0	Denotes the start of a string table entry in a DCS string
p	7/0	Denotes the start of a Power-on string in a DCS
x	7/8	Repeat-key flag
y	7/9	Local-only flag
z	7/10	Transmit-only flag
{	7/11	Shift into lower-case
	7/12	Index to the next (sequential) string
}	7/13	Shift back to upper-case
~	7/14	Control-shift (non-latching)

T A B L E II : OPERATIONAL STRINGS

INDEX				
CHAR	CODE	STRING	DEFAULT	DESCRIPTION
sp	2/0	HEADER	Null	Precedes all transmissions to host
!	2/1	TRAILER	Null	Follows all transmissions to host
#	2/3	ENQ	Null	Terminal's response to ENQ control
\$	2/4	DA	Revision/ release #	Terminal's response to DA control

T A B L E III : PROGRAMMABLE KEY STRINGS

NOTE: x and y are used in this table to indicate keys which repeat (x) or which operate locally (y). Local-only strings may include ESC sequences, in the range ESC d through ESC o, which perform operations that have no external code representation. (They may be executed only by depressing a key programmed to operate locally).

INDEX	CHAR CODE	PROGRAMMABLE KEY	DEFAULT	DESCRIPTION
"	2/2	SEND (Sim SRM)	Null	Send key in Simultaneous SRM
%	2/5	SEND (Mon SRM)	ESC S	STS (Set Transmit State)
&	2/6	RESET	ESC c	RIS (Reset to Initial State)
'	2/7	SETUP	y ESC d	Enter Setup mode
(	2/8	BREAK	y ESC e	Send short break
)	2/9	SHIFT-BREAK	y ESC f	Send long break
*	2/10	PAUSE	y ESC g	See zAPM (Auto Pause Mode)
+	2/11	RETURN	CR or CRLF	See zRLM (Return Key CRLF Mode)
,	2/12	MOVE UP	xy ESC [ T	See SD (Scroll Down)
-	2/13	SHIFT-MOVE UP	xy ESC i	Move up window
.	2/14	MOVE DN	xy ESC [ S	See SU (Scroll Up)
/	2/15	SHIFT-MOVE DN	xy ESC j	Move down window
0	3/0	SHIFT-0	null	Control keypad 0-key
1	3/1	SHIFT-1	ESC F	SSA (Start of Selected Area)
2	3/2	SHIFT-2	x ESC [ B	See CUD (Cursor Down)
3	3/3	SHIFT-3	ESC G	ESA (End of Selected Area)
4	3/4	SHIFT-4	x ESC [ D	See CUB (Cursor Backward)
5	3/5	SHIFT-5	ESC [ H	See CUP (Cursor Position)
6	3/6	SHIFT-6	x ESC [ C	See CUF (Cursor Forward)
7	3/7	SHIFT-7	ESC [ g	See TBC (Tabulation Clear)
8	3/8	SHIFT-8	x ESC [ A	See CUU (Cursor Up)
9	3/9	SHIFT-9	ESC H	HTS (Horizontal Tab Set)
:	3/10	PERIOD	.	Code 2/14
;	3/11	TAB	x HT	HT (Horizontal Tab)
<	3/12	ENTER	CR or CRLF	Same as RETURN
=	3/13	SHIFT-TAB	x ESC [ Z	See CBT (Cursor Back Tab)
>	3/14	ERASE	ESC [ K	See EL (Erase in Line)
?	3/15	SHIFT-ERASE	ESC [ J	See ED (Erase in Display)
@	4/0	EDIT	ESC 6	zTI (Toggle IRM)
A	4/1	DELETE	x ESC [ P	See DCH (Delete Character)
B	4/2	SHIFT-DELETE	x ESC [ M	See DL (Delete Line)
C	4/3	INSERT	x ESC [ @	See ICH (Insert Character)
D	4/4	SHIFT-INSERT	x ESC [ L	See IL (Insert Line)
E	4/5	PRINT	ESC [ i	See MC (Media Copy)
F	4/6	SHIFT-PRINT	y ESC k	Toggle local copy
G	4/7	CTRL-SHIFT-7	ESC [ 3 g	See TBC (Tabulation Clear)

(Continued)

T A B L E III : PROGRAMMABLE KEY STRINGS (Continued)

=====				
INDEX				
CHAR	CODE	PROGRAMMABLE KEY	DEFAULT	DESCRIPTION
=====				
H	4/8	PF1	ESC O A	See zFIM (Function Key Initialize)
I	4/9	PF2	ESC O B	applies to all PF keys
J	4/10	PF3	ESC O C	
K	4/11	PF4	ESC O D	
L	4/12	PF5	ESC O E	
M	4/13	PF6	ESC O F	
N	4/14	PF7	ESC O G	
O	4/15	PF8	ESC O H	
P	5/0	PF9	ESC O I	
Q	5/1	PF10	ESC O J	
R	5/2	PF11	ESC O K	
S	5/3	PF12	ESC O L	
T	5/4	SHIFT-PF1	ESC O M	
U	5/5	SHIFT-PF2	ESC O N	
V	5/6	SHIFT-PF3	ESC O O	
W	5/7	SHIFT-PF4	ESC O P	
X	5/8	SHIFT-PF5	ESC O Q	
Y	5/9	SHIFT-PF6	ESC O R	
Z	5/10	SHIFT-PF7	ESC O S	
[	5/11	SHIFT-PF8	ESC O T	
\	5/12	SHIFT-PF9	ESC O U	
]	5/13	SHIFT-PF10	ESC O V	
^	5/14	SHIFT-PF11	ESC O W	
_	5/15	SHIFT-PF12	ESC O X	
		SHIFT-PAUSE	y ESC h	Advance window (zAPM set)
		CTRL-PAUSE	y ESC l	Set zAPM
		CTRL-SHIFT-PAUSE	y ESC m	Reset zAPM
		CTRL-MOVE UP	xy ESC n	Zoom up
		CTRL-MOVE DN	xy ESC o	Zoom down

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## INITIALIZING THE TERMINAL

OPERATOR CONTROL. The operator may initialize (or re-initialize) the terminal in any of the following ways:

POWER-ON. Each time the terminal is powered on, it goes through an Initialization procedure. In sequence:

- The ROM and RAM memories are tested; see Self Test, below.
- The Programmable keys are initialized (to their default values).
- The Power-on string is loaded into the FIFO
- The Non-Volatile Memory (NVM) checksum is verified.
- Working RAM is initialized from the NVM.
- I/O is initialized.
- Display RAM is initialized.
- The Power-on string is executed.
- The cursor is displayed.

SETUP Z. Typing the 2-key sequence, SETUP Z, causes the terminal to go through the same Initialization procedure (as at power-on), except that it does not drop the DTR (Data Terminal Ready) signal to the host (pin 20 on the RS232 connector). This is the preferred method for re-initializing after power-on, because it does not break the connection to the host.

RESET KEY. Depressing CTRL-SHIFT-RESET causes the terminal to re-initialize, but starting AFTER initialization of the Programmable keys (ie, the Self Test is not repeated, and the existing contents of the Programmable keys are left undisturbed).

In all cases, if it is desired that the Power-on string NOT be executed, hold down the RESET key during the initialization. (The RESET key is checked prior to loading the Power-on string into the FIFO. If depressed, the string is not loaded, and hence not executed.)

HOST CONTROL. The host may initialize the terminal with the RIS (ESC c) control. This performs the same function as the operator's RESET key (ie, starts with loading of the Power-on string). The host cannot initiate Self Test. The host cannot return the Programmable keys to their default values (but can re-program them to their default values; see Programmable Strings section).

NOTE. No data, including pads, should be sent to the terminal for at least 200 ms. following an RIS control, to allow the terminal time to re-initialize its I/O. If the USART comes out of initialization in the middle of a received character, that character and probably following characters will be garbled, with indeterminate effect.

## DATA LINE MONITORING

The Ambassador provides an extremely powerful Data Line Monitoring capability. This includes a unique Data Monitor Line (that permits monitoring the data without disturbing the terminal's normal operation or display), as well as a conventional full-screen Data Monitor (that can display the last 4800 characters received). Couple this with the Ambassador's Meta Monitor Mode (that permits the display of 8-bit data), and its ability to transmit (full-screen) monitored data back to the host, and you have a Data Monitor capability exceeding that of many high-priced commercial Data Monitors.

**NORMAL MONITORING.** The Received Data line (pin 3 of the Communications connector) normally accepts 7-bit data and parity. The Baud Rate, Parity, and Stop Bits expected are controlled by settings on Setup line B.

If Parity Detection (on Setup line B) is set, the parity of each incoming character is compared against the parity expected. If different, an error symbol (checkerboard) is displayed on the screen (instead of the character). The Data Monitor Line can be referenced to see what character the terminal thought it received.

If Meta Monitor Mode (zMMM, B,57) is set, the terminal is able to accept 8-bit data (in lieu of parity, ie, the setting of Parity Detection does not apply). It may be used with the Data Monitor Line, or Transparent mode, to monitor 8-bit data. (When used with the Data Monitor Line, the low-order 7-bits are processed normally by the terminal.)

**DATA MONITOR LINE.** The Data Monitor Line permits you to monitor the incoming data while the terminal is in normal operation. This can be used to see what the host is sending when you're first installing the terminal, or trying to use an unfamiliar system, or trying out a new piece of software, or simply to isolate a system problem to the terminal or the host.

Typing the 2-key sequence, SETUP M, brings the Data Monitor Line to the Screen. The line displays the last 79 codes that have been processed by the terminal. The SSA symbol (forward-pointing triangle) is used as a separator on the line. The last code processed is shown immediately before the symbol and the oldest code immediately after the symbol. The symbol appears as a needle pulling the string of characters around the Monitor line.

Graphic character codes (2/0 to 7/15 inclusive) are displayed as their graphic characters, just as they are in the text in the Window above. Control codes (0/0 to 1/15 inclusive) are displayed as a Reverse rendition of their corresponding upper-case characters, for easy identification.

If Parity Detection is set, characters received with Parity error are displayed with the additional rendition of Bold Underline. Examples:

A displayed Normal	Upper-case A
A displayed Reverse	CTRL-A (SOH)
A displayed Bold, Underlined	A w/ parity error
A displayed Reverse, Bold, Underlined	SOH w/ parity error

If Meta Monitor Mode is set, characters that have a high-order 'one' (ie, 8th bit set), are displayed with the additional rendition of Bold Underline. Ex-



amples:

A displayed Normal	Uppercase A
A displayed Reverse	CTRL-A (SOH)
A displayed Bold, Underlined	A w/ 8th bit=1
A displayed Reverse, Bold, Underlined	SOH w/ 8th bit=1

Using the PAUSE key, in conjunction with this display, provides a powerful system debugging facility. You can operate the terminal normally yet, when an unexpected result occurs, pause, and review the sequence of codes that led up to it.

When the Data Monitor line is no longer needed, simply type the SETUP key twice to remove it from the display.

TRANSPARENT MODE. Transparent mode permits the entire display Page (up to 60 lines by 80 characters) to be used as a Data Monitor. The last 4800 codes received are stored, and may be viewed at one time. In addition, the captured data may be transmitted back to the host for analysis; see Send Controls section, zGRM (Graphic Rendition Transfer Mode).

Typing the 2-key sequence, SETUP X, puts the terminal into Transparent mode. Incoming codes are displayed exactly as they were for the Data Monitor Line, except that now they are displayed in the terminal's Window, and the terminal's entire Page is available to store them; see Display section, Definitions.

When Transparent mode is no longer needed, simply type the SETUP key twice to return the terminal to normal operation.

Toggling into and out of Transparent mode, does not affect the data presently stored and displayed (until codes are received, whereupon they scroll up naturally in the Page). Thus, the mode may be used, at any time, to capture a few lines of incoming codes for analysis, without totally eliminating the context of what you're doing.

#### LOCAL TEST MODE

Local Test mode is useful for performing terminal operations without involving the host, eg, to exercise the terminal to see how a particular control (or control sequence) works, to enter (or annotate) data prior to a Page Print, or simply to test the terminal to isolate a problem to the terminal, host, or printer. The Data Monitor line is displayed during Local Test to permit you to see exactly what codes you're entering.

Typing the 2-key sequence, SETUP T, puts the terminal into Local Test, with the Monitor line on the screen. The terminal's outgoing data line is wrapped back into its incoming data line within the terminal's communications interface. Codes are not sent to or received from the host. (However, the Data-Terminal-Ready output at the Communications connector remains 'on'.)

Typing the SETUP key twice, removes the Data Monitor line from the screen and returns the terminal to normal operation.

## SELF TEST

The Ambassador performs a Self-Test procedure each time it is powered on (and in response to SETUP Z; see Initialization, above). In sequence:

- The bell beeps.
- The Program ROM checksums are verified.
- Working RAM is tested.
- Display RAM is tested.

If an error is found, the bell beeps, a 'MEMORY ERROR' flag is set, and the tests are re-started (from the beginning). Later in the initialization, if the NVM checksum does not verify, a 'CHECKSUM ERROR' flag is set. Upon completion of the initialization, if either error flag is set, the error message is displayed.

The following conclusions follow from observed results:

If the terminal beeps once, the cursor appears, and no error messages are displayed, the terminal has found no errors in its tests and has completed its initialization.

If the terminal beeps more than once, but the cursor appears and no error messages are displayed, the power supply is having trouble starting. This may indicate a power supply problem, but may also occur if the terminal is cold or the line voltage is low.

If the terminal beeps repeatedly and no cursor appears, the terminal has encountered a hard failure in its Self Test. The tests may be aborted, and the terminal forced to display, by holding down any key. The terminal may or may not operate correctly, depending on where and how bad the error is. If it does operate correctly, the trouble may be further localized with the diagnostics under Memory Errors below.

**CHECKSUM ERRORS.** A CHECKSUM ERROR message indicates that the contents of NVM have changed since they were last saved. If you wish to disregard the error and continue operating, go into Setup mode, review and correct the terminal settings, and type the letter, S, to re-save them.

Repeated Checksum errors indicate a problem with the battery or with the CMOS RAM (PC board position 16H or 18H; see Technical Manual), and should be checked out by a qualified service person. The battery is a 3V lithium type (Panasonic #BR2325mm LI (wPCmt) 3V or equivalent) located in a plug-in socket on the Logic daughter board. It should last for 2-3 years of normal operation.

**MEMORY ERRORS.** A MEMORY ERROR message indicates that one or more errors were detected during Self Test. If you wish to disregard the error and try operating anyway, depress CTRL-SHIFT-RESET. This re-initializes the terminal without performing the Self Test.

**NOTE:** The memory tests are run with worst-case timing, ie, worse than in normal operation. It is quite possible to get an error message, and find that the terminal works normally. The error message is an 'alert' that something is becoming

marginal.

To determine where the errors occurred, enter Setup mode and display line D. The last number in the line shows the location (ie, PC board position; see Technical Manual) of the last error found:

1-63 = Display RAM error (positions 3E-8E; see Note)  
99 = Program ROM error (position 3F, 6F, or 8F)  
128-135 = Working RAM error (position 5F)

Note: A number between 1-63 tells which RAM or RAMs, according to the binary weighting 1=3E, 2=4E, 4=5E, 8=6E, 16=7E, 32=8E.

The test results do not necessarily say that a RAM is 'bad' -- only that the terminal found one or more errors in reading or writing it. This may be the result of a bad RAM, but it may also be the result of a mis-adjusted power supply voltage or an associated logic chip.

SETUP Y. If an intermittent error is suspected, the memory tests may be run repeatedly (eg, overnight) by typing the 2-key sequence, SETUP Y. The bell will beep each time an error is detected. The tests will end when any key is held down on the keyboard. The last error found, if any, will be displayed in Setup line D.

NOTE: Before starting the tests, make sure that the the number at the end of line D is zero (since it is overwritten only if an error occurs).



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### ANSI X3.64 STANDARD

The Ambassador uses the control-function code space defined by ANSI X3.64 "Additional Controls For Use With American National Standard Code For Information Interchange". The corresponding International Standard is ISO DP 6429. These Standards define a set of encoded control functions to facilitate data interchange with two-dimensional imaging devices, including display and printer terminals.

ANSI X3.64 augments the set of control functions defined in ANSI X3.4 (ASCII) and ANSI X3.41. The types of controls defined by X3.64 include cursor functions, editing functions, formatting functions, specification/control of input areas, setting/interrogation of status, mode selections, etc. The code structure defined is similar to escape sequences, but permits the inclusion of numeric and selective parameters. The paragraphs below summarize aspects of the Standard that are important to understanding the Ambassador; the reader is referred to the Standard itself for more detail. Copies of the Standard may be ordered from the American National Standards Institute, 1430 Broadway, New York, New York 10018, (212)354-3300.

### CODE NOTATION

For consistency with the Standard, codes are represented by column/row of the ASCII table; see Appendix, page A-2. For example, the code for the character "K" is written as 4/11 (which is also 4B hex).

### CONTROL CODES

The Ambassador recognizes and responds to only those ASCII control codes (0/0 to 1/15 inclusive) shown in the Appendix, Control Codes table.

## ESCAPE SEQUENCES

One of these control codes, ESC (1/11) tells the terminal to look at the next code(s) and assemble an escape sequence. Valid escape sequences are of the form:

ESC I...I F

ESC is the introducer code 1/11.

I...I are intermediate codes in the range 2/0 (Sp) to 2/15 (/) inclusive (and are not used by the Ambassador).

F is the final code in the range 3/0 (0) to 7/14 (~) inclusive.

The terminal assembles the sequence and, if it is one of the sequences recognized by the terminal (see Appendix, Escape Sequences table), executes the control function called for by the sequence. Otherwise it ignores the entire sequence.

## CONTROL SEQUENCES

If the code immediately following the ESC (1/11) code is a final code 5/11 ([), the terminal is told to assemble a control sequence. Valid control sequences are of the form:

CSI P...P I...I F

CSI is the two-code sequence 1/11 5/11 (ESC [)

P...P are parameter codes in the range 3/0 (0) to 3/15 (?) inclusive.

I...I are intermediate codes in the range 2/0 (Sp) to 2/15 (/) inclusive (and are not used by the Ambassador).

F is the final code in the range 4/0 (@) to 7/14 (~) inclusive.

The terminal assembles the sequence and, if it is one of the sequences recognized by the terminal (see Appendix, Control Sequences table), executes the control function called for by the sequence. Otherwise it ignores the entire sequence.

## PARAMETERS

The parameter portion of a control sequence may represent one of more parameter values. Each parameter may consist of one of more codes in the range 3/0 (0) to 3/9 (9), inclusive (representing the parameter value in decimal). Parameters are separated from each other by a 3/11 (;) code. There are two types of parameters: numeric and selective. Numeric parameters are used to pass numeric values. Selective parameters are used to select particular entries from a specified list. The form of both types is the same.

## NUMERIC PARAMETERS

The value passed by a numeric parameter is its decimal value (using the codes 3/0 (0) through 3/9 (9)). The value relates as directly as possible to the function (eg, line 12, column 56, move 34 columns, etc.). In each parameter, leading 3/0 (0) codes are not significant, and may be included or omitted. The maximum parameter value recognized by the Ambassador is 255.

## SELECTIVE PARAMETERS

The value passed by a selective parameter is also a decimal value, but specifies which entry (in a table of functions applicable to the control) is being called for. For example, the EL (Erase in Line) control permits following parameter values: 0 (= from cursor to end), 1 (= from start to cursor), or 2 (= all of line).

## DEFAULT VALUE

If a parameter is omitted, or consists only of 3/0 (0) codes, it is given a default value which is specified in the control description.

## PRIVATE-USE PROVISIONS

The Standard provides for the addition of non-standard control sequences (to add features not envisioned by the standard) in two ways:

- 1) If the first code in the parameter string (of a control sequence) is 3/12 (<) to 3/15 (?) inclusive, then the entire parameter string is subject to private interpretation.
- 2) If the final character (of a control sequence) is 7/0 (p) to 7/14 (~) inclusive, then the entire sequence is subject to private interpretation.

The Ambassador has used these provisions to add certain features to its control set. For users who wish to adhere rigidly to the Standard, these features are not necessary to operation of the terminal.





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## INTRODUCTION

The purpose of this Appendix is to catalog all of the Ambassador's controls and modes for reference.

The Code Table section catalogs the Ambassador's controls, by code, in three tables: Control codes, Escape sequences, and Control sequences. These tables define the total code space used, and recognized, by the Ambassador.

The Descriptions section catalogs the Ambassador's controls and modes alphabetically by their ANSI (or private-use) mnemonic. The Ambassador's private-use controls and modes are identified by a leading lower-case 'z'; see User Guide, Introduction. We have chosen to ignore the leading 'z' in the alphabetic sort, eg, zDBM follows DAQ and precedes DC1.

The Ambassador's modes are also listed in two other places. In the Descriptions section, under the SM (Set Mode) control, they are listed by mode number. In the Setup section of the User Guide, they are listed by Setup line location.

### CONTROLS:

By mnemonic	Appendix, Descriptions
By code	Appendix, Control Tables

### MODES:

By mnemonic	Appendix, Descriptions
By mode number	Appendix, Descriptions, SM (Set Mode)
By Setup line	Setup section

The notation used in the Appendix is consistent with that used in the other sections; see User Guide, Introduction, Notational Conventions.



ESCAPE SEQUENCES. Valid Ambassador escape sequences are two-code sequences having the form, ESC F. The Ambassador responds to escape sequences with the final character shown in the table. It ignores all others.

Column	0	1	2	3	4	5	6	7
Row	-----							
0	.	.	.	.	.	DCS	DMI	.
1	.	.	.	.	.	.	INT	.
2	.	.	.	.	.	.	EMI	.
3	.	.	.	.	.	STS	RIS	.
4	.	.	.	.	IND	.	.	.
5	.	.	.	zTFC	NEL	.	.	.
6	.	.	.	zTI	SSA	SPA	.	.
7	.	.	.	zSC	ESA	EPA	.	.
8	.	.	.	zRC	HTS	.	.	.
9	.	.	.	zCGR	HTJ	.	.	.
10	.	.	.	zGUA	.	.	.	.
11	.	.	.	.	.	CSI	.	.
12	.	.	.	.	.	ST	.	.
13	.	.	.	.	RI	.	.	.
14	.	.	.	.	.	.	.	.
15	.	.	.	.	.	.	.	.

CONTROL SEQUENCES. Valid Ambassador control sequences are multi-code sequences having the form, CSI P...P F. The Ambassador responds to control sequences with the final character shown in the table. It ignores all others. Caution: A semicolon (3/11) must be used to separate parameters in multiple parameter control sequences.

Column	0	1	2	3	4	5	6	7
Row	-----							
0	.	.	.	.	ICH	DCH	HPA	zSDP
1	.	.	.	.	CUU	SEE	HPR	.
2	.	.	.	.	CUD	CPR	REP	.
3	.	.	.	.	CUF	SU	DA	zPSH
4	.	.	.	.	CUB	SD	VPA	zPOP
5	.	.	.	.	CNL	.	VPR	zSTP
6	.	.	.	.	CPL	.	HVP	zSRC
7	.	.	.	.	CHA	CTC	TBC	zSPF
8	.	.	.	.	CUP	ECH	SM	.
9	.	.	.	.	CHT	.	MC	.
10	.	.	.	.	ED	CBT		zSTE
11	.	.	.	.	EL	.		.
12	.	.	.	.	IL	.	RM	.
13	.	.	.	.	DL	.	SGR	.
14	.	.	.	.	EF	.	DSR	.
15	.	.	.	.	EA	.	DAQ	.

## DESCRIPTIONS

The Ambassador's controls and modes are described below, arranged alphabetically by mnemonic (with the leading lower-case z ignored). For mode descriptions, the Setup line letter and mode number are shown in parentheses following the mode name. A dash (-) indicates that the mode is not provided on a Setup line.

## zACM ALTERNATE CURSOR MODE (-,51)

The Ambassador provides two separate and independent sets of registers for cursor position and graphic rendition. This mode selects which set is referenced and affected by the incoming data stream.

In the RESET state, the incoming data stream references and affects the Primary registers. Significant characteristics of the Primary cursor are: (1) Its position is confined to the Page. (2) Its position (in the Window) is noted with a visible cursor symbol. (3) Erase and edit operations with the Primary cursor affect only the contents of the Page.

In the SET state, the incoming data stream references and affects the Alternate registers. Significant characteristics of the Alternate cursor are: (1) It can access all of Display Memory, including the Host Areas and Inactive Memory. (2) Its position is not visible, even if writing into the Window. (3) Erase and edit operations affect all of Display Memory. (4) Controls that require a line number parameter may require a different parameter value depending on which cursor is used. Address 1 of the Primary cursor points to the top line of the Page; address 1 of the Alternate cursor points to the top line of Display Memory. These may differ by the number of lines of Upper Host Area. (5) The zSDP control, or any editing control that would move data below the Page, may not be used with the Alternate cursor.

During Monitor SRM, the operator is restricted to the Primary cursor, regardless of the state of zACM. The host may use the Alternate cursor to write to the terminal without interrupting the operator. Host entries into the Page may be affected by operator actions (eg, erase, edit, scroll); DMI may be used to prevent this interaction. Likewise, host actions in or above the Page may affect the contents of the Page.

## zAKDM AUTO KEYBOARD DISABLE MODE (B,46)

In the RESET state, the keyboard is immediately enabled upon completion of transmissions from the terminal's Display Memory to the host.

In the SET state, an implicit DMI control is performed at the completion of transmission, causing the keyboard to remain disabled until purposefully released by the host with an EMI control.

**zAPM AUTO PAUSE MODE (A,38)**

In the RESET state, typing the PAUSE key causes the terminal to suspend the processing of data from its received-data FIFO buffer. When the FIFO becomes nearly full, an XOFF control is sent to the host to suspend further transmission of data. When the PAUSE key is typed again, the terminal resumes the processing of data from the FIFO. When the FIFO becomes nearly empty, an XON control is sent to the host to resume the transmission of data.

In the SET state, the processing of data from the FIFO is normally suspended. Typing the PAUSE key causes the terminal to process and display a single line of data from the FIFO. Typing SHIFT-PAUSE causes the terminal to process and display (two lines less than) a window-full of data from the FIFO. As in the reset state, XOFF and XON controls are sent to the host to avoid FIFO overflow.

In either state, typing CTRL-PAUSE sets zAPM. Typing CTRL-SHIFT-PAUSE resets zAPM. If zAXM is in the reset state, or if the host continues to send data despite receiving an XOFF, the terminal automatically resumes processing to avoid FIFO overflow.

**zAXM AUTO XOFF/XON MODE (B,37)**

In the RESET state, the terminal is not permitted to send XOFF and XON controls to the host.

In the SET state, the terminal is permitted to send an XOFF control to the host to indicate that its received-data FIFO buffer is nearly full. The host is expected to suspend further transmission to the terminal until the terminal sends an XON control (indicating that the FIFO is nearly empty). The FIFO is a 256-character buffer. An XOFF is sent when the FIFO fills to 128 characters. A second XOFF is sent (in case the first was garbled) if the FIFO continues to fill to 160 characters. If the FIFO continues to fill to 224 characters, the terminal takes action to avoid loss of data; specifically, FIFO processing is resumed, Local Copy is terminated, and zSSM is reset.

**BEL BELL (0/7)**

Causes an audible bell tone to sound.

**zBKCM BLOCK CURSOR MODE (A,31)**

In the RESET state, the Underline rendition of the character at the cursor is complemented. If the character is rendered without Underline, the cursor is displayed as an Underline. If the character is rendered with Underline, the cursor is displayed as the absence of Underline.

In the SET state, the Reverse rendition of the character at the cursor is complemented. If the character is rendered as a 'white' character on a black field, the cursor is displayed as a 'white' field with black

character. If the character is rendered as a black character on a 'white' field, the cursor is displayed as a black field with 'white' character.

#### zBNCM BLINKING CURSOR MODE (A,32)

In the RESET state, the cursor is displayed Bold and non-Blinking.

In the SET state, the cursor is displayed Bold and Blinking. The character at the cursor is alternated, at the blink rate, between its rendition at the cursor position and its rendition when not at the cursor position.

#### BS BACKSPACE (0/8)

Moves the cursor left one column. If zDBM is set, it also erases the character at that position. The rendition erased to depends on the setting of the GR-register; see SGR. If zWBM is set, the cursor may wrap to the preceding line. If zACM is reset, the cursor may not move past the beginning of the Page.

#### CBT CURSOR BACKWARD TABULATION (ESC [ Pn Z)

Moves the cursor left Pn tab stops. If zWBM is set, the cursor may wrap to preceding lines. If zACM is reset, the cursor may not move past the beginning of the Page.

#### zCGR CHANGE GRAPHIC RENDITION (ESC 9)

Changes the graphic rendition of the character at the cursor, and all following characters in the active Qualified Area (see DAQ), to that specified by the present setting of the GR-register; see SGR.

#### CHA CURSOR HORIZONTAL ABSOLUTE (ESC [ Pn G)

Positions the cursor to column Pn in the active line. The cursor may not move past the line margins. This control is equivalent to HPA in the Ambassador implementation.

#### CHT CURSOR HORIZONTAL TABULATION (ESC [ Pn I)

Moves the cursor right Pn tab stops. If zWFM is set, the cursor may wrap to following lines. If zACM is reset, the cursor may not move past the end of the Page.

**zCLIM CAPS LOCK INVERT MODE (A,54)**

This mode is applicable only to the 26 alphabetic keys with the CAPS LOCK key depressed.

In the RESET state, the keys generate upper-case codes, both unshifted and shifted.

In the SET state, the keys generate upper-case codes, unshifted, and lower-case codes, shifted.

**CNL CURSOR NEXT LINE (ESC [ Pn E)**

Moves the cursor down Pn lines to beginning of line. If zACM is reset, the cursor may not move past the bottom of the Page.

**zCNM CR NEW-LINE MODE (D,55).**

In the RESET state, entry or receipt of a CR (0/13) code moves the cursor to the beginning of the active line.

In the SET state, entry or receipt of a CR code moves the cursor to the beginning of the next line.

**CPL CURSOR PRECEDING LINE (ESC [ Pn F)**

Moves the cursor up Pn lines to beginning of line. If zACM is reset, the cursor may not move past the top of the Page.

**CPR CURSOR POSITION REPORT (ESC [ Pn1 ; Pn2 R)**

Format for the report of cursor position. The parameters are the same as used by the CUP and HVP controls, ie, line Pn1, column Pn2. The report is solicited with the DSR control, ESC [ 6 n. The position reported is that of the Primary cursor regardless of the state of zACM.

**CR CARRIAGE RETURN (0/13)**

Moves the cursor to the beginning of the active line. If zCNM is set, it also does an implicit LF. If zCNM is set, zSPM and zACM are reset, and the cursor is in the bottom line of the Page, it does a scroll up of all data in the Page (losing the contents of the top line).

**CSI CONTROL SEQUENCE INTRODUCER (ESC [)**

Introduces a control sequence.

**zCSTM COLUMN SEPARATOR TRANSFER MODE (B,43)**

In the RESET state, columnar tab stops do not cause HT (0/9) codes to be inserted into transmissions from the terminal's Display Memory to the host.

In the SET state, an HT code is inserted at each columnar tab stop. All spaces (2/0) immediately preceding the tab stop are suppressed in the transmission.

**CTC CURSOR TABULATION CONTROL (ESC [ Ps W)**

Sets or clears tab stops as selected by Ps:

- 0 Sets a tab stop at the cursor (default)
- 2 Clears the tab stop at the cursor
- 4 Clears all tab stops in the active line
- 5 Clears all tab stops

If TSM is reset, only columnar tab stops are affected. If TSM is set, page tab stops are affected; see DAQ. This control is equivalent to HTS in setting tab stops. It is equivalent to TBC (in function, but not in parameter values) in clearing tab stops.

**CUB CURSOR BACKWARD (ESC [ Pn D)**

Moves the cursor left Pn columns. If zWBM is set, the cursor may wrap to preceding lines. If zACM is reset, the cursor may not move past the beginning of the Page.

**CUD CURSOR DOWN (ESC [ Pn B)**

Moves the cursor down Pn lines. If zACM is reset, the cursor may not move past the bottom of the Page.

**CUF CURSOR FORWARD (ESC [ Pn C)**

Moves the cursor right Pn columns. If zWFM is set, the cursor may wrap to following lines. If zACM is reset, the cursor may not move past the end of the Page.

**CUP CURSOR POSITION (ESC [ Pn1 ; Pn2 H)**

Positions the cursor to line Pn1, column Pn2. If zACM is reset, Pn1 references the beginning of Page and the cursor may not move outside the Page boundaries. If zACM is set, Pn1 references the beginning of Active Memory. This control is equivalent to HVP in the Ambassador implementation.



## CUU CURSOR UP (ESC [ Pn A)

Moves the cursor up Pn lines. If zACM is reset, the cursor may not move past the top of the Page.

## DA DEVICE ATTRIBUTES (ESC [ Pn c)

Provides a means for communicating device identification. The host may request the terminal to identify itself by sending the default control (ESC [ c). The terminal responds with a DA control containing a device identification parameter. In the Ambassador implementation, this is the release-revision-option number of the terminal's firmware. For example, the parameter value 01;17;00 says that the unit is an Ambassador (=01), revision 17, with no options (=00). (The release number of the Genie is 05; the release number of the Genie Plus is 06.) An alternative string may be down-loaded from the host with the DCS control.

## DAQ DEFINE AREA QUALIFICATION (ESC [ Ps..Ps o)

Sets an Area Qualifier at the present cursor position, starting a Qualified Area, and assigning control attributes to it as selected by each Ps:

UNPROTECTED (Ps= 0). Local Entry is permitted into the Area.

PROTECTED/GUARDED (Ps= 1). Local Entry is not permitted into the Area, AND the contents of the Area will not be included in transmissions to the host (if GATM is reset) or in transfers to the printer (if zGAPM is reset).

NUMERIC ONLY (Ps= 3). Local Entry is permitted into the Area, but restricted to numerics and punctuation only (codes 2/0 (Sp) to 3/15 (?) inclusive).

RIGHT JUSTIFY (Ps= 5). Local Entry is permitted into the Area, but is right justified when leaving the Area with the TAB key (ie, the entry is shifted right until a non-Space character occupies the last character position in the Area).

PAGE TAB STOP (Ps= 7). Sets a page tab stop at the beginning of the Area. The tab stop is active in respect to entries from the host, as well as Local Entry.

PROTECTED/UNGUARDED (Ps= 8). Local Entry is not permitted into the Area, but the contents of the Area are included in transmissions to the host and transfers to the printer, regardless of the settings of GATM and zGAPM.

If the first character in the parameter string is a > (3/14), the string is interpreted as a private-use parameter string supporting the standard parameters above, plus the following:

CONCEALED (Ps= 18). Local Entry is permitted into the Area, but is

displayed only as 'white' spaces (2/0).

The Area Qualifiers are stored in a control table indexed by character position. If any Area Qualifier has been set, a Forms flag is set, and the Display Processor references the table as part of processing its input. If the input is a local keyboard input, (ie, from the Keystroke buffer), the Display Processor references the table for each input. If the input is received from the host (ie, from the FIFO buffer), the Display Processor references the table only when it receives one of the tab controls, HT, CHT, CBT, or HTJ.

The table can hold up to 380 Area Qualifiers. However, there must be at least one entry in the table for each of 60 display lines, ie, the table capacity is reduced by 60 minus the number of lines that contain no Qualifiers.

The control SPA is equivalent to DAQ with a parameter value of 1. The control EPA is equivalent to DAQ with a parameter value of 7.

If TSM is set, the controls HTS, TBC, and CTC set and clear the tab stop attribute in Area Qualifiers without changing its other qualifications. Setting a tab stop adds the attribute to an existing Area Qualifier, or sets a new Area Qualifier (having the same qualifications as the preceding Qualifier). Clearing tab stops removes the attribute from the Area Qualifiers affected. If adjacent Area Qualifiers are left with the same qualification, the second Qualifier is removed.

If ERM is set, the controls EA, EF, EL, ED, and ECH remove Area Qualifiers from the region affected.

The Forms flag comes up reset at power-on. It is set by the first occurrence of any of the controls DAQ, SPA, EPA, or HTS (with TSM set). It may be reset by RIS, by erasing the entire Page with ERM set, or by zSDP (which permits clearing the form without erasing the Page); see Forms section.

#### zDBM DESTRUCTIVE BACKSPACE MODE (D,30)

In the RESET state, the BS (0/8) control causes the cursor to move left one column.

In the SET state, the BS control causes the cursor to move left one column and to erase the character at that position.

#### DC1 DEVICE CONTROL 1 (1/1)

Sets the Communications Ready Flag (CRF) in the terminal's communications interface. If CRF is set, AND the Clear-to-Send (CTS) input signal at the communications connector is 'on' (or open), this control enables data to be transmitted from the terminal's Display Memory to the host; see STS.

## DC3 DEVICE CONTROL 3 (1/3)

Resets the Communications Ready Flag (CRF) in the terminal's communications interface. This control may be used by the host to prohibit or suspend the transmission of data from the terminal's Display Memory to the host. CRF is set at power-on. The host may reset it by sending the DC3 control, or condition the terminal to reset CRF automatically after transmitting each line of data; see zLTM. The host may re-enable or re-start the transmission by sending the DC1 control.

## DCH DELETE CHARACTER (ESC [ Pn P)

Deletes Pn characters, starting with the character at the cursor, by shifting the remaining characters in the editing region to the left. The position of the cursor is not changed. Character positions vacated at the end of the editing region are erased. The rendition erased to is determined by the setting of the GR-register; see SGR. The extent of the editing region is determined by the setting of the EE-register; see SEE. If zACM is set, the control may not be used with an EE setting of zero (ie, to end of Page).

## DCS DEVICE CONTROL STRING (ESC P)

Indicates the beginning of a device control string. A device control string is a string of graphic codes 2/0 (Sp) to 7/14 (~) inclusive, starting with the first character after the DCS control and terminating with the ST control. The DCS control is used by the Ambassador to pass programming information to the terminal; see Programmable Strings section.

## zDDM DEL-CHARACTER DISPLAY MODE (D,35)

In the RESET state, the DEL (7/15) code is ignored by the terminal.

In the SET state, the DEL code is accepted by the terminal as a valid graphic character and displayed as a block symbol.

## DL DELETE LINE (ESC [ Pn M)

Deletes the contents of Pn lines, starting with the active line, by shifting the following lines upward. The position of the cursor is not changed. Lines vacated at the end of the Page are erased. The rendition erased to is determined by the setting of the GR-register; see SGR. If zACM is set, the control may not be used.

## DMI DISABLE MANUAL INPUT (ESC `)

Sets KAM, which causes the keyboard to be disabled, except for the RESET, SETUP, and BREAK keys. These keys may be disabled by programming them with a null string. When the keyboard is disabled, key entry is

inhibited (attempted entries result in an error 'beep') and the cursor is not displayed.

DSR DEVICE STATUS REPORT (ESC [ Ps n)

Provides a means for communicating device status or cursor position. The host may request the terminal for status by sending the DSR control with a parameter value of 5. The terminal responds with the DSR control with a parameter value of 0 or 1, as follows:

- 0 Ready (default)
- 1 Busy - retry later
- 5 Please report status (using a DSR control)
- 6 Please report cursor position (using a CPR control)

The busy response (ESC [ 1 n) means that a Page Print or Local Copy to the printer (see MC) is in progress and the screen should not be cleared. If the host's request contains a > (3/14), preceding the 5 (3/5), the busy response is not returned. Rather, the terminal suspends further processing from its FIFO until the print has been completed, and then returns a ready response (ESC [ n).

EA ERASE IN AREA (ESC [ Ps 0)

Erases some or all of the characters in the active Qualified Area as selected by Ps:

- 0 From cursor to end inclusive (default)
- 1 From start to cursor inclusive
- 2 All of the Qualified Area

The rendition erased to is determined by the setting of the GR-register; see SGR. If ERM is set, protected characters may be erased, a page tab stop may be cleared, and the Qualified Area may be removed; see DAQ.

ECH ERASE CHARACTER (ESC [ Pn X)

Erases the following Pn characters, starting with the character at the cursor. The rendition erased to is determined by the setting of the GR-register; see SGR. If ERM is set, protected characters may be erased, page tab stops may be cleared, and Qualified Areas may be removed; see DAQ.

ED ERASE IN DISPLAY (ESC [ Ps J)

Erases some or all of the characters in the Page as selected by Ps:

- 0 From cursor to end inclusive (default)
- 1 From start to cursor inclusive
- 2 All of the Page

The rendition erased to is determined by the setting of the GR-register; see SGR. If ERM is set, protected characters may be erased, page tab stops may be cleared, and Qualified Areas may be removed; see DAQ.

EF ERASE IN FIELD (ESC [ Ps N)

Erases some or all of the characters in the active field as selected by Ps:

- 0 From cursor to end inclusive (default)
- 1 From start to cursor inclusive
- 2 All of the field

The rendition erased to is determined by the setting of the GR-register; see SGR. If ERM is set, protected characters may be erased, page tab stops may be cleared, and Qualified Areas may be removed; see DAQ.

EL ERASE IN LINE (ESC [ Ps K)

Erases some or all of the characters in the active line as selected by Ps:

- 0 From cursor to end inclusive (default)
- 1 From start to cursor inclusive
- 2 All of the line

The rendition erased to is determined by the setting of the GR-register; see SGR. If ERM is set, protected characters may be erased, page tab stops may be cleared, and Qualified Areas may be removed; see DAQ.

EMI ENABLE MANUAL INPUT (ESC b)

Resets KAM, which causes the keyboard to become enabled, and repositions the operator's window if necessary to contain the cursor.

ENQ ENQUIRY (O/5)

Causes the terminal to transmit a character string previously downloaded from the host with the DCS control. If no string has been downloaded, the control is ignored.

EPA END OF PROTECTED AREA (ESC W)

Sets an Area Qualifier with unprotected and tab stop attributes. This control is equivalent to a DAQ control with a parameter value of 7.

**ERM ERASURE MODE (D,6)**

In the RESET state, the controls EA, EF, EL, ED and ECH do not erase characters in protected Qualified Areas. They cannot affect the position of tab stops or Qualified Areas.

In the SET state, these controls erase characters regardless of their protected status, and may clear page tab stops and remove Qualified Areas; see DAQ.

**ESA END OF SELECTED AREA (ESC G)**

Writes an ESA symbol (backward-pointing triangle) at the cursor position. The ESA symbol is the end of a string of consecutive characters selected for subsequent transmission to the host or printer (see SATM, MATM). The beginning of the string is identified by an SSA symbol. The ESA symbol (and its control function) may be erased by erase controls, moved by edit controls, and is included in transmissions. The symbol is transmitted to the host as its escape sequence. It is transmitted to the printer as a Space (2/0) code.

**ESC ESCAPE (1/11)**

Introduces an escape sequence.

**ETX END OF TEXT (0/3)**

If received in the data stream following a zSRC control with a zero or default parameter, this control indicates the end of the data to be printed and terminates the Remote Copy operation. It is ignored otherwise.

**FETM FORMAT EFFECTOR TRANSFER MODE (B,14).**

In the RESET state, line separators are inserted into all transmissions from the terminal's Display Memory to the host. A separator is inserted at the end of each line from which characters have been transmitted. All spaces (2/0) immediately preceding the line separators are suppressed in the transmission. LNM selects CRLF (LNM reset) or LF (LNM set) as the line separator.

In the SET state, line separators are not inserted into transmissions to the host.

**FF FORM FEED (0/12)**

This control is equivalent to LF (0/10) in the Ambassador implementation except that, if it is received with Local Copy on (see MC), the line that it terminates is tagged both to be printed and as end of (printed) page. When the line has been transferred to the printer, the terminal

issues the necessary number of new-line codes (or an FF-code, if the Form Feed setting on Setup line C has been selected) to advance the paper to the top of the next page.

zFIM FUNCTION-KEY INITIALIZE MODE (A,50)

In the RESET state, the keys PF1-12 come up in a disabled state at power-on (ie, they generate no codes).

In the SET state, the keys PF1-12 generate the sequences ESC O A through ESC O L respectively. With SHIFT depressed, they generate the sequences ESC O M through ESC O X respectively.

zFRM FAST REPEAT MODE (A,47)

This mode is significant only if zKRM is set.

In the RESET state, the key repeat rate is approximately 22 char/sec.

In the SET state, the key repeat rate is approximately 30 char/sec.

zFSTM FIELD SEPARATOR TRANSFER MODE (B,44)

In the RESET state, page tab stops do not cause HT (0/9) codes to be inserted into transmissions from the terminal's Display Memory to the host.

In the SET state, an HT code is inserted at each page tab stop. All spaces (2/0) immediately preceding the tab stop are suppressed in the transmission.

zGAPM GUARDED AREA PRINT MODE (C,49)

In the RESET state, characters located in guarded Qualified Areas (see DAQ) are printed as space (2/0) codes.

In the SET state, characters are printed regardless of their guarded qualification.

GATM GUARDED AREA TRANSFER MODE (B,1)

In the RESET state, characters located in guarded Qualified Areas (see DAQ) are not included in transmissions to the host.

In the SET state, characters are transmitted regardless of their guarded qualification.

**zGRTM GRAPHIC RENDITION TRANSFER MODE (B,45)**

In the RESET state, no SGR controls are inserted into transmissions to the host.

In the SET state, an SGR control is inserted at the beginning of transmission, to convey the rendition of the initial position, and thereafter at each change in rendition.

**zGUA GUARD UNPROTECTED AREAS (ESC :)**

Causes all unprotected Qualified Areas in the Page (see SPA, EPA, DAQ) to be guarded against transmission. Thereafter, any operator entry into a Qualified Area causes that area to become unguarded. May be used in conjunction with field separators (see zFSTM), to provide for transmission of only areas actually modified.

**zHAM HOLD IN AREA MODE (A,48)**

This mode is applicable only to keyboard input during Monitor SRM.

In the RESET state, when the operator enters a graphic character into the last character position of an unprotected Qualified Area (see SPA, EPA, DAQ), or uses the RIGHT-ARROW key at that position, the cursor auto-skips forward to the beginning of the next unprotected Area.

In the SET state, the cursor remains at that position, requiring use of the TAB key to advance to the next page tab stop.

**zHDM HALF-DUPLEX MODE (B,40)**

This mode applies to all keyboard inputs in Simultaneous SRM. In Monitor SRM, it applies only to inputs from keys programmed as Transmit-only by the DCS control.

In the RESET state, keyboard inputs are sent only to the host.

In the SET state, keyboard inputs are sent to the host and are echoed back locally within the terminal's communication interface.

**HPA HORIZONTAL POSITION ABSOLUTE (ESC [ Pn `)**

Positions the cursor to column Pn in the active line. The cursor may not move past the line margins. This control is equivalent to CHA in the Ambassador implementation.



## HPR HORIZONTAL POSITION RELATIVE (ESC [ Pn a)

Moves the cursor right Pn columns. The cursor may not move past the right margin.

## HT HORIZONTAL TABULATION (O/9)

Moves the cursor right to the next tab stop. If zWFM is set, the cursor may wrap to following lines. If zWFM is set, zSPM and zACM are reset, and the cursor is at the last tab stop in the Page, all data in the Page scrolls up one line (losing the contents of the top line).

## HTJ HORIZONTAL TAB WITH JUSTIFY (ESC I)

Shifts the characters between the preceding tab stop and the cursor, but not including the character at the cursor, forward up to the next tab stop (or end of line, whichever is first). The character positions between the preceding tab stop and the new beginning of the shifted string are erased. The rendition erased to is determined by the setting of the GR-register; see SGR. The cursor moves to the next tab stop. If zWFM is set, the cursor may wrap to following lines. If zWFM is set, zSPM and zACM are reset, and the cursor is at the last tab stop in the Page, all data in the Page scrolls up one line (losing the contents of the top line).

## HTS HORIZONTAL TAB SET (ESC H)

Sets a tab stop at the cursor. If TSM is reset, a columnar tab stop is set. If TSM is set, a page tab stop is set. Setting a page tab stop may start a Qualified Area; see DAQ. This control is equivalent to the CTC control, ESC [ W.

## HVP HORIZONTAL AND VERTICAL POSITION (ESC [ Pn1 ; Pn2 f)

Positions the cursor to line Pn1, column Pn2. If zACM is reset, Pn1 references the beginning of Page, and the cursor may not move outside the Page boundaries. If zACM is set, Pn1 references the beginning of Active Memory. This control is equivalent to CUP in the Ambassador implementation.

## ICH INSERT CHARACTER (ESC [ Pn @)

Inserts Pn spaces (2/0) at the cursor by shifting the character at the cursor, and all following characters in the editing region, to the right. Characters shifted past the end of the editing region are lost. The position of the cursor is not changed. The rendition of the inserted characters is determined by the setting of the GR-register; see SGR. The extent of the editing region is determined by the setting of the EE-register; see SEE. If zACM is set, the control may not be used with an EE-setting of zero (ie, to end of Page).

**zICM INVISIBLE CURSOR MODE (D,56)**

In the RESET state, the cursor symbol is displayed in accordance with the state of zBKCM and zBNCM.

In the SET state, the cursor symbol is not displayed.

**IL INSERT LINE (ESC [ Pn L)**

Inserts Pn erased lines by shifting the contents of the active line, and all following lines, downward. The position of the cursor is not changed. Lines shifted past the end of Page are lost. The rendition of the inserted lines is determined by the setting of the GR-register; see SGR. If zACM is set, the control may not be used.

**IND INDEX (ESC D)**

Moves the cursor down one line. If zSPM and zACM are reset and the cursor is in the bottom line of the Page, all data in the Page scrolls up on line (losing the contents of the top line).

**zINM IGNORE NUL MODE (B,54)**

In the RESET state, NUL (0/0) codes received in the incoming data stream are put into the FIFO (so they may be passed on to the printer in Remote Copy).

In the SET state, NUL codes received in the incoming data stream are ignored (ie, not put into the FIFO) so that they may be used as pad characters on systems that cannot accomodate Xon/Xoff flow control; see zAXM. The following is the worst-case execution time of the Ambassador's long controls. Typical is much less.

Insert/delete line	3 ms.
Insert/delete char (in line)	4
Push/pop line	5
Erase line	5
Erase 60 lines	156
Change graphic rendition	283
Insert/delete char (in display)	304
Erase 60 lines with max DAQ's	2368

**INT INTERRUPT (ESC a)**

This control is detected at the input to the terminal's FIFO, and causes the terminal to terminate a print or send in process.

**IRM** INSERTION-REPLACEMENT MODE (-,4)

In the RESET state, the entry or receipt of a graphic character causes the appropriate graphic symbol to replace the symbol currently imaged at the cursor, and then moves the cursor forward one character position.

In the SET state, the entry or receipt of a graphic character causes the appropriate graphic symbol to be inserted at the cursor, after shifting the character at the cursor, and all following characters in the editing region, forward one character position, and then moves the cursor forward one character position. The extent of the editing region is determined by the setting of the EE-register; see SEE. If zACM is set, the mode may not be used in this state with an EE-setting of zero (ie, to end of Page).

**KAM** KEYBOARD ACTION MODE (B,2)

In the RESET state, keyboard input is enabled.

In the SET state, keyboard input is disabled, except for the RESET, SETUP, and BREAK keys. These keys may be disabled by programming them with a null string. When the keyboard is disabled, key entry is inhibited (attempted entries result in an error 'beep') and the cursor is not displayed.

**zKCM** KEY CLICK MODE (A,26)

In the RESET state, no audible feedback of key entry is generated.

In the SET state, an audible key click is sounded as each character is entered.

**zKPCM** KEY PAD CONTROL MODE (A,27)

In the RESET state, the control keypad generates the numeric set of the graphic characters and requires depression of the SHIFT key to generate terminal control functions.

In the SET state, the control keypad generates the terminal control functions and requires depression of the SHIFT key to generate the numeric set of graphic characters.

**zKRM** KEY REPEAT MODE (A,28)

Selects the keys that automatically repeat when held down for more than 1/2 second. (The repeat rate is determined by zFRM.)

In the RESET state, the four cursor ARROW keys, plus TAB, INSERT, and DELETE, repeat. (These keys may be re-programmed to not repeat.)

In the SET state, the number keys on the Control keypad and all keys on

the Main keypad (except ESC, PAUSE, BREAK, and RETURN) also repeat.

LF LINE FEED (0/10)

Moves the cursor down one line. If LNM is set, it also does an implicit CR (0/13). If zSPM and zACM are reset and the cursor is in the bottom line of the Page, all data in the Page scrolls up one line (losing the contents of the top line).

LNM LINE FEED NEW LINE MODE (D,20)

In the RESET state, the LF (0/10) code moves the cursor down one line.

In the SET state, LF moves the cursor to the beginning of the next line, effecting the NL (New Line) option of ANSI X3.4. This mode does not affect the IND or NEL controls.

zLTM LINE TRANSFER MODE (B,42)

In the RESET state, the transmission of data from the terminal's Display Memory to the host is not automatically suspended at end of line.

In the SET state, the transmission of data from the terminal's Display Memory to the host is automatically suspended, by resetting the Communications Ready Flag (CRF) after each LF code. The host is required to send the DC1 control (to set CRF) after receiving each line, to complete the transmission.

MATM MULTIPLE AREA TRANSFER MODE (B,15)

This mode is applicable only if SATM is reset.

In the RESET state, only the single Selected Area containing the cursor is transmitted to the host or printer. Transmission starts with the first preceding SSA symbol. If there is no preceding SSA symbol, an SSA symbol is implied at the beginning of the Page. If an ESA symbol is encountered before an SSA symbol, the operation is terminated and the control is ignored. If TTM is reset, an ESA symbol is implied at the cursor and transmission terminates with the cursor position. If TTM is set, transmission terminates with the first occurrence of an ESA symbol. If there is no terminating ESA symbol, one is implied at the end of the Page.

In the SET state, all Selected Areas in the Page are transmitted. The transfer pointer starts scanning from the beginning of Page (unless otherwise set; see zSTP). Transmission is enabled by SSA symbols and disabled by ESA symbols. If the first symbol encountered is an ESA symbol, an SSA symbol is implied at the initial transfer-pointer position. If TTM is reset, scanning terminates at the cursor. If TTM is set, scanning continues to end of Page (unless otherwise set; see zSTE). In either case, an ESA symbol is implied at that point, and transmission ter-

minates.

Actual SSA and ESA symbols are included in the transmission; implied symbols are not. The symbols are transmitted to the host as their escape sequence. They are transferred to the printer as space (2/0) codes.

zMBM MARGIN BELL MODE (A,25)

In the RESET state, no audible feedback is generated as the cursor approaches the right margin.

In the SET state, an audible bell is sounded whenever the operator types a graphic character with the cursor in column 72.

MC MEDIA COPY (ESC [ Ps i)

Controls the transfer of data to the printer as selected by Ps:

- 0 Print Page (default)
- 4 Turn off Local Copy
- 5 Turn on Local Copy

A parameter value of 0 initiates transfer from the terminal's Display Memory to the printer. All transfers start at the beginning of Page, unless otherwise specified; see zSTP. All transfers end at the cursor (TTM reset) or the end of Page (TTM set), unless otherwise specified; see zSTE. The form and content of the transfer are affected by the following modes:

- MATM Multiple Area Transfer Mode
- SATM Single Area Transfer Mode
- zGAPM Guarded Area Print Mode

A parameter value of 5 enables Local Copy. All data received by the terminal are also copied to the printer. The data are copied from Display Memory (not from the data stream) after each display line has been completed with an LF or NEL control.

A parameter value of 4 disables Local Copy.

With either method of print, the format of the printout (margin and page size) may be specified with the zSPF control. Any transfer in progress to the printer may be aborted with the INT or RIS controls.

zMKM META KEY MODE (B,52).

In the RESET state, the PAUSE key may be used to regulate the flow of received data; see zAPM.

In the SET state, the PAUSE key acts as a META SHIFT key, to facilitate use of the terminal with software that uses the parity bit for 8-bit

data transmission. If held down while any other key is struck, the key code is transmitted with its parity bit equal to 'one'. Otherwise, the parity bit is transmitted equal to 'zero' (regardless of the Setup parity settings). If the Pause functions are desired during Meta Key mode, they may be moved to other keys with the DCS control.

**zMMM META MONITOR MODE (B,57)**

In the RESET state, the terminal accepts 7-bit data and parity in the incoming data stream. If the Parity Detection bit (on Setup line B) is set, parity errors are displayed as an error symbol (checkerboard) on the screen, and as the character rendered in Bold Underline on the Data Monitor line.

In the SET state, the terminal accepts 8-bit data (in lieu of parity) in the incoming data stream. Characters received with the 8th bit equal to 'one' are displayed in the Data Monitor line rendered in Bold Underline. The 7-bit portion of the data (after stripping the 8th bit) is displayed on the screen.

**NEL NEXT LINE (ESC E)**

Moves the cursor to the beginning of the next line. If zSPM and zACM are reset and the cursor is in the bottom line of the Page, all data in the Page scrolls up one line (losing the contents of the top line).

**zPOP POP LINE (ESC [ Pn t)**

Moves the contents of Pn lines at the bottom of the Page to (start at) the active line, by shifting the active line, and all following lines, downward. The cursor position is unchanged. If zACM is set, the control may not be used.

**zPSH PUSH LINE (ESC [ Pn s)**

Moves the contents of Pn lines, starting with the active line, to the bottom of Page, by shifting the bottom lines of the Page upward. The cursor position is unchanged. If zACM is set, the control may not be used.

**zRC RESTORE CURSOR (ESC 8)**

Restores the cursor position (and rendition setting) to its 'saved' values; see zSC. If zACM is reset, it restores the values to the Primary cursor. If zACM is set, it restores the values to the Alternate cursor.

REP REPEAT (ESC [ Pn b)

Causes the single graphic character immediately preceding the control to be repeated Pn times.

RI REVERSE INDEX (ESC M)

Moves the cursor up one line. If zSPM and zACM are reset and the cursor is in the top line of the Page, all data in the Page scrolls down one line (losing the bottom line).

RIS RESET TO INITIAL STATE (ESC c)

This control is detected at the input to the terminal's FIFO and causes the terminal to reset to its power-on condition, except that the string table (see DCS) is not re-initialized. No data, including pads, should be sent to the terminal for at least 200 ms. following an RIS control, to allow the terminal time to re-initialize its I/O. If the USART comes out of initialization in the middle of a received character, that character and probably following characters will be garbled, with indeterminate effect.

zRLM RETURN KEY CRLF MODE (A,29)

In the RESET state, the RETURN key generates the CR code (0/13).

In the SET state, the RETURN key generates the two-code sequence CR LF (0/13 0/10).

RM RESET MODE (ESC [ Ps..Ps l)

Resets modes of the terminal as selected by each Ps. Multiple Ps must be separated by a ; (3/11). The control has both a standard and private-use form; see SM.

SATM SELECTED AREA TRANSFER MODE (B,17)

In the RESET state, the contents of Selected Areas (see SSA, ESA) are transmitted to the host or printer. Characters outside of Selected Areas are not transmitted. If MATM is reset, only the active Selected Area is transmitted. If MATM is set, all Selected Areas are transmitted.

In the SET state, characters are transmitted regardless of their Selected status.

**zSC SAVE CURSOR (ESC 7)**

Saves the cursor position and rendition setting in a temporary buffer for later recall; see zRC. If zACM is reset, the Primary cursor position and associated rendition are saved. If zACM is set, the Alternate cursor position and associated rendition are saved.

**SD SCROLL DOWN (ESC [ Pn T)**

Moves the contents of the Window down Pn lines, permitting the display of preceding lines. The position of the cursor (in the Page) is not changed.

**zSDP SET DISPLAY PARAMETERS (ESC [ Pn1 ; Pn2 ; Pn3 ; Pn4 p)**

Partitions the terminal's Display Memory and Screen, according to the parameters:

**ACTIVE MEMORY SIZE (Pn1).** Specifies the number of lines of Display Memory to be used. Valid values are 18 to 60 inclusive. The power-on value is 60. If the parameter is omitted or zero, the present values of Active Memory size, and Upper and Lower Host Area size, remain unchanged.

**UPPER HOST AREA SIZE (Pn2).** Specifies the number of lines to be used for an Upper Host Area. These lines are always displayed at the top of the Screen and may be written into only by the host. The power-on and default value is 0.

**LOWER HOST AREA SIZE (Pn3).** Specifies the number of lines to be used for a Lower Host Area. These lines are always displayed at the bottom of the Screen and may be written into only by the host. The power-on and default value is 0.

**SCREEN SIZE (Pn4).** Specifies the number of lines to be displayed on the Screen, including Host Areas if any. Valid values are any of the values 18, 20, 22, 24, 26, 28, 30, 36, 40, 48, or 60. Power-on value is 30. If the parameter is omitted or zero, the present value of the Screen size remains unchanged.

The value of Pn1 should be greater than Pn2 + Pn3. The value of Pn4 should be greater than Pn2 + Pn3 + 1. This control does not affect the contents of Display Memory; only the partitioning. It resets the Forms flag (see DAQ), and moves the cursor to home.

**SEE SELECT EDITING EXTENT (ESC [ Ps Q)**

Sets an EE-register that determines the extent of the Page affected by the DCH and ICH controls, and by data entered or received with IRM set, as selected by Ps:

0 Edit in Page (default)



- 1 Edit in Line
- 2 Edit in Field (between tab stops)
- 3 Edit in Qualified Area (see DAQ, SPA, EPA)

SGR SELECT GRAPHIC RENDITION (ESC [ Ps..Ps m)

Sets a GR-register that determines the graphic rendition with which characters subsequently entered or received are displayed as selected by each Ps. Multiple Ps must be separated by a ; (3/11).

- 0 Normal (default)
- 1 Bold or increased intensity
- 4 Underscore
- 5 Blink
- 7 Reverse (black character on 'white' field)
- 8 Concealed (security)

The contents of the GR-register are appended to all characters written into the Page, including spaces (2/0) written as a result of erase and edit controls. The rendition is a part of the displayed character. When the character is erased or moved, its rendition is erased or moved with it. If zGRTM is set, the rendition information is included in transmissions to the host; see STS.

SM SET MODE (ESC [ Ps..Ps h)

Sets modes within the terminal as selected by each Ps. Multiple Ps must be separated by a ; (3/11).

- 1 GATM Guarded Area Transfer Mode.
- 2 KAM Keyboard Action Mode.
- 4 IRM Insertion-Replacement Mode.
- 6 ERM Erasure Mode.
- 12 SRM Send-Receive Mode.
- 14 FETM Format Effector Transfer Mode.
- 15 MATM Multiple Area Transfer Mode.
- 16 TTM Transfer Termination Mode.
- 17 SATM Selected Area Transfer Mode.
- 18 TSM Tabulation Stop Mode.
- 20 LNM Line Feed New Line Mode.

If the first character in the parameter string is a > (3/14), the string is interpreted as a private-use parameter string supporting the standard parameters above, plus the following:

- 25 zMBM Margin Bell Mode
- 26 zKCM Key Click Mode
- 27 zKPCM Key Pad Control Mode
- 28 zKRM Key Repeat Mode
- 29 zRLM Return Line Feed Mode
- 30 zDBM Destructive Backspace Mode
- 31 zBKCM Block Cursor Mode
- 32 zBNCM Blinking Cursor Mode

33	zWFM	Wrap Forward Mode
34	zWBM	Wrap Backward Mode
35	zDDM	DEL-character Display Mode
36	zSPM	Scroll-Page Mode
37	zAXM	Auto Xoff/Xon Mode
38	zAPM	Auto Pause Mode
39	zSSM	Slow Scroll Mode
40	zHDM	Half-Duplex Mode
41	zTPDM	Transfer Pointer Display Mode
42	zLTM	Line Transfer Mode
43	zCSTM	Column Separator Transfer Mode
44	zFSTM	Field Separator Transfer Mode
45	zGRTM	Graphic Rendition Transfer Mode
46	zAKDM	Auto Keyboard Disable Mode
47	zFRM	Fast Repeat Mode
48	zHAM	Hold in Area Mode
49	zGAPM	Guarded Area Print Mode
50	zFIM	Function-key Initialize Mode
51	zACM	Alternate Cursor Mode
52	zMKM	Meta Key Mode
53	zCLIM	Caps Lock Invert Mode
54	zINM	Ignore NUL Mode
55	zCNM	CR New-Line Mode
56	zICM	Invisible Cursor Mode
57	zMMM	Meta Monitor Mode

#### SPA START OF PROTECTED AREA (ESC V)

Sets an Area Qualifier with protected attribute. This control is equivalent to a DAQ control with a parameter value of 1.

#### zSPF SET PRINT FORMAT (ESC [ Pn1 ; Pn2 ; Pn3 w)

Sets the format of printed copy resulting from use of the MC control according to the parameters:

PRINTED LINES (Pn1). Valid values are 0 to 126 inclusive. A non-zero value specifies the number of lines to be printed per page and takes the present position of the printer as the top of page. If the parameter is omitted or zero, the printer is caused to feed forward to the top of the next page, and the present value of Printed Lines, Total Lines, and Left Margin to remain unchanged.

TOTAL LINES (Pn2). Specifies the total number of lines per page. Valid values are 0 to 126. If the parameter is omitted or zero, the present value of Total Lines remains unchanged.

LEFT MARGIN (Pn3). Specifies the number of space (2/0) codes to be sent to the printer at the beginning of each line to set the Left Margin of the printout. Valid values are 0 to 254 inclusive. Default value is 0.

**zSPM** SCROLL-PAGE MODE (D,36)

In the RESET state, the terminal is in Scroll mode. Attempts to move the cursor past the bottom of Page with the IND, LF, or NEL controls, or past the end of Page with the HT or HTJ controls or graphic character entry (if zWFM is reset), cause the cursor to remain in the bottom line, and all characters in the Page to scroll up one line. The top line is removed and the bottom line is erased. Similarly, attempts to move the cursor past the top of Page with the RI control cause the cursor to remain in the top line, and all characters in the Page to scroll down one line. The bottom line is removed and the top line is erased. In either case, the rendition erased to is determined by the setting of the GR-register; see SGR.

In the SET state, the terminal is in Page mode. Attempts to move the cursor past the bottom of Page with the IND, LF, or NEL controls are ignored. Attempts to move the cursor past the end of Page with the HT or HTJ controls or graphic character entry cause the cursor to move to (or remain at) the end of the Page. Similarly, attempts to move the cursor past the top of Page with the RI control are ignored.

**zSRC** START REMOTE COPY (ESC [ Pn v)

Causes the characters and controls that follow to be copied directly to the printer interface, and not displayed or executed by the terminal. The parameter specifies the number of bytes to be copied. If the parameter is omitted, copy continues until the first occurrence of an ETX (0/3) code in the data stream.

**SRM** SEND-RECEIVE MODE (B,12)

In the RESET state, the terminal is in the Monitor SRM. Keyboard inputs are not sent to the host as they are keyed. They are, instead, displayed and executed locally, and the resultant display subsequently sent to the host as a block; see STS. The inputs do not use the terminal's received-data FIFO. The FIFO may be used by the host to buffer data to the printer (see zSRC) and/or to Display Memory.

In the SET state, the terminal is in Simultaneous SRM. The keyboard is logically disconnected from the display. Keyboard inputs are passed to the terminal's communications interface and sent to the host as they are keyed. The host may echo the inputs back to the display or the inputs may be echoed back locally (zHDM set). In either case, the inputs become part of the incoming data stream and are buffered through the terminal's FIFO (see zAXM).

**SSA** START OF SELECTED AREA (ESC F)

Writes an SSA symbol (forward pointing triangle) at the cursor position. The SSA symbol is the first of a string of consecutive characters selected for subsequent transmission to the host or printer; see SATM, MATM. The end of the string is identified by an ESA symbol. The SSA

symbol (and its subsequent control function) may be erased by erase controls, moved by edit controls, and is included in transmissions. The symbol is transmitted to the host as its escape sequence. It is transmitted to the printer as a space (2/0) code.

**zSSM SLOW SCROLL MODE (A,39)**

In the RESET state, characters received in the incoming data stream are processed and displayed at the incoming character rate.

In the SET state, characters received in the incoming data stream are displayed at a maximum rate of 4 lines per second. The terminal suspends processing of data from the received-data FIFO buffer as required to maintain this display rate. If the FIFO becomes nearly full, an XOFF control is sent to the host to suspend further transmission of data. When the FIFO becomes nearly empty, an XON control is sent to the host to resume the transmission of data. If zAXM is reset (prohibiting the transmission of XOFF), the terminal automatically resets zSSM and resumes processing if the FIFO becomes full.

**ST STRING TERMINATOR (ESC \)**

When received in the data stream following a DCS control, indicates the end of the character string to be transferred and terminates the transfer. It is ignored otherwise.

**zSTE SET TRANSFER END (ESC [ Pn1 ; Pn2 z)**

Sets the ending address of the transfer pointer to line Pn1, column Pn2. The transfer includes the character at this position. A parameter value of zero (or omission of the parameter) for either parameter sets the ending address to the present cursor position for that parameter. At the completion of each transfer, the pointer is restored to the end of the Page. If TTM is reset, the transfer may terminate at the cursor.

**zSTP SET TRANSFER POINTER (ESC [ Pn1 ; Pn2 u)**

Sets the starting address of the transfer pointer to line Pn1, column Pn2. The transfer includes the character at this position. A parameter value of zero (or omission of the parameter) for either parameter sets the starting address to the present cursor position for that parameter. At the completion of each transfer, the pointer is restored to the beginning of the Page.

**STS SET TRANSMIT STATE (ESC S)**

Sets a Transmit Ready Flag (TRF) notifying the terminal's communications interface that the displayed data are ready to be transmitted to the host. This control initiates transmission if the Communications Ready Flag CRF) is set (see DC1, DC3) and the Clear-to-Send (CTS) control in-

put signal at the communications connector is 'on'.

All transmissions start at the beginning of Page, unless otherwise specified; see zSTP. All transmissions end at the cursor (TTM reset) or the end of Page (TTM set), unless otherwise specified; see zSTE. The form and content of the transmission are affected by the following modes:

- FETM Format Effector Transfer Mode
- GATM Guarded Area Transfer Mode
- MATM Multiple Area Transfer Mode
- SATM Single Area Transfer Mode
- zCSTM Column Separator Transfer Mode
- zFSTM Field Separator Transfer Mode
- zGRTM Graphic Rendition Transfer Mode
- zLTM Line Transfer Mode

During an operator-initiated transmission, the keyboard is disabled and the cursor symbol is not displayed. A transfer pointer symbol may be displayed; see zTPDM. At completion of the transmission, TRF is reset and the keyboard is enabled, unless otherwise specified; see zAKDM. Receipt of an STS control from the host does not remove the operator's cursor or disable the keyboard. The host is permitted to read all or any part of Display Memory without interfering with the operator's entry. A transmission in progress may be aborted with the INT or RIS controls.

SU SCROLL UP (ESC [ Pn S)

Moves the contents of the Window up Pn lines, permitting the display of following lines. The position of the cursor (in the Page) is not changed.

TBC TABULATION CLEAR (ESC [ Ps g)

Clears one or more tab stops as selected by Ps:

- 0 Clears the tab stop at the cursor (default).
- 2 Clears all tab stops in the active line.
- 3 Clears all tab stops.

If TSM is reset, it clears columnar tab stops. If TSM is set, it clears page tab stops, and may remove Qualified Areas (see DAQ). This control is equivalent to CTC (in function but not in parameter values).

zTFC TOGGLE FAST-BLINK CURSOR (ESC 5)

Toggles the cursor symbol between its 'normal' display (as selected by zBKCM and zBKNM) and a fast-blinking block, for operator attention or warning.

**zTI TOGGLE IRM (ESC 6)**

Toggles the state of IRM, ie, resets it if set, and sets it if reset.

**zTPDM TRANSFER POINTER DISPLAY MODE (A,41)**

During operator-initiated transmission of data from the terminal's Display Memory to the host or printer, the cursor symbol is not displayed (because operator entry is disabled); see STS, MC.

In the RESET state, no other marker is displayed. Reappearance of the cursor indicates completion of the operation.

In the SET state, a marker (block symbol) is displayed at the present transfer pointer position.

**TSM TABULATION STOP MODE (D,18)**

In the RESET state, the controls HTS, TBC, and CTC set and clear columnar tab stops. Columnar tab stops apply to all lines in the page. They are preset at power-on to columns 1, 9, 17, 25, 33, 41, 49, 57, 65, and 73. If all columnar tab stops are cleared, a columnar tab stop is implied in column 1.

In the SET state, these controls set and clear page tab stops. Page tab stops apply to individual character positions in the page. None are set at power-on.

**TTM TRANSFER TERMINATION MODE (B,16)**

In the RESET state, transfer of characters from Display Memory terminates with the cursor position.

In the SET state, transfer of characters from Display Memory terminates with the last character position in the Page.

The character located at the terminating position is sent, if eligible to be sent; see GATM, SATM, MATM.

**VPA VERTICAL POSITION ABSOLUTE (ESC [ Pn d)**

Positions the cursor to line Pn in the active column. If zACM is reset, Pn references the beginning of the Page, and the cursor may not move outside the Page. If zACM is set, Pn references the beginning of Active Memory.

**VPR VERTICAL POSITION RELATIVE (ESC [ Pn e)**

Moves the cursor down Pn lines. This control is equivalent to CUD in the Ambassador implementation.

**VT VERTICAL TABULATION (0/11)**

This control is equivalent to LF (0/10) in the Ambassador implementation.

**zWBM WRAP BACKWARD MODE (D,34)**

In the RESET state, attempts to move the cursor past the left margin with the controls BS, CBT, or CUB cause the cursor to remain at the left margin.

In the SET state, attempts to move the cursor past the left margin with these controls cause the cursor to wrap to the preceding line.

**zWFM WRAP FORWARD MODE (D,33)**

In the RESET state, attempts to move the cursor past the right margin with the controls CHT, CUF, HT, or HTJ, or by the entry of graphic characters, cause the cursor to remain at the right margin.

In the SET state, attempts to move the cursor past the right margin with these controls, or by the entry of graphic characters, cause the cursor to wrap to the next line.

**XON DEVICE ON (Setup line B)**

This control may be sent from the terminal to the host to indicate a FIFO 'nearly empty' condition; see zAXM. The code to be used is selected (in decimal) on Setup line B. Default is DC1 (1/1).

**XOFF DEVICE OFF (Setup line B)**

This control may be sent from the terminal to the host to indicate a FIFO 'nearly full' condition; see zAXM. The code to be used is selected (in decimal) on Setup line B. Default is DC3 (1/3).





ANN ARBOR AMBASSADOR  
USER'S GUIDE  
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Ann Arbor has developed this User's Guide to assist you in understanding and implementing the many features contained in the Ann Arbor Ambassador terminals.

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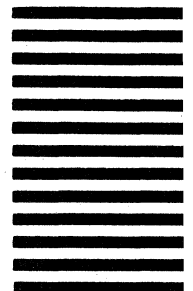
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## DEC MODE OPTION

This option augments the Ann Arbor Ambassador with a line-drawing capability, plus some DEC private-use (ie, non-ANSI) features that permit the terminal to be used with standard VT100/VT52 software. The added controls and modes are summarized below.

Note: DEC, VT100, and VT52 are registered trademarks of the Digital Equipment Corporation.

## SELECT CHARACTER SET

Three character sets (ASCII, UK, and Graphics) are provided, any two of which may be selected at one time. The ASCII set is the standard character set defined by ANSI X3.4. The UK set replaces the character corresponding to code 2/3 (#) with the British pound sign. The Graphics set replaces the characters corresponding to codes 6/0 (`) through 7/14 (~) as shown in the table below. Characters noted in the table as 'Reserved' are displayed as spaces. All non-ASCII characters are transmitted as 2/0 (Space) codes during send/print operations.

6/0 (') Diamond	7/0 (p) Scan line 3
6/1 (a) Checkerboard	7/1 (q) Scan line 5
6/2 (b) Reserved	7/2 (r) Scan line 7
6/3 (c) Reserved	7/3 (s) Scan line 9
6/4 (d) Reserved	7/4 (t) Left 'T'
6/5 (e) Reserved	7/5 (u) Right 'T'
6/6 (f) Degree symbol	7/6 (v) Bottom 'T'
6/7 (g) Plus/minus	7/7 (w) Top 'T'
6/8 (h) Reserved	7/8 (x) Vertical bar
6/9 (i) Reserved	7/9 (y) Less than or equal
6/10 (j) Lower-right corner	7/10 (z) Greater than or equal
6/11 (k) Upper-right corner	7/11 (}) Reserved
6/12 (l) Upper-left corner	7/12 ( ) Not equal
6/13 (m) Lower-left corner	7/13 (}) British pound
6/14 (n) Crossing lines	7/14 (~) Reserved
6/15 (o) Scan line 1	

The SCSG0 and SCSG1 controls determine which two (of the three) character sets are selected. The SI and SO controls determine which one (of the two) are active. The terminal powers on with ASCII selected for both the G0 and G1 sets, and the G0 set active.

**SCSG0** SELECT CHARACTER SET G0 (ESC ( Fc)

Designates the G0 character set from one of the available sets depending on the final character Fc:

A (4/1) United Kingdom set  
 B (4/2) ASCII set  
 0 (3/0) Graphics set

**SCSG1** SELECT CHARACTER SET G1 (ESC ) Fc)

Designates the G1 character set from one of the available sets depending on the final character Fc:

A (4/1) United Kingdom set  
 B (4/2) ASCII set  
 0 (3/0) Graphics set

**SI** SHIFT IN (0/15)

Causes characters subsequently entered or received to be displayed from the G0 character set.

**SO** SHIFT OUT (0/14)

Causes characters subsequently entered or received to be displayed from the G1 character set.

**decANM** VT52/ANSI MODE (ESC [ ? 2 1)

Puts the terminal into VT52 mode. The mode is displayed near the end of Line D. It can be changed in Setup mode but the reset (VT52) state cannot be 'Saved', ie, the terminal always comes up in ANSI mode.

In the RESET state, the terminal responds only to VT52-compatible codes, as follows:

=====	=====	=====
CONTROL	CODE	AMBASSADOR KEY
=====	=====	=====
Cursor Up	ESC A	UP-ARROW/8
Cursor Down	ESC B	DN-ARROW/2
Cursor Right	ESC C	RT-ARROW/6
Cursor Left	ESC D	LT-ARROW/4
Select Graphics	ESC F	SSA/1
Select ASCII	ESC G	ESA/3
Home	ESC H	HOME/5
Reverse Line Feed	ESC I	
Erase to End of Page	ESC J	ERASE (shifted)
Erase to End of Line	ESC K	ERASE
Direct Cursor Address	ESC Y 1 c	
Exit VT52 Mode	ESC <	

In the SET state, the terminal responds to the normal Ambassador con-

trol set.

decOM ORIGIN MODE (ESC [ ? 6 Fc)

Sets/resets the mode according to the final character Fc: 6/8 (h) sets it, 6/12 (l) resets it. The mode is displayed near the end of Line D. It can be changed (and 'Saved') in Setup mode.

In the RESET state, the origin is the first character position within the display Page. Line numbers are independent of the current top/bottom margin settings.

In the SET state, the origin is the first character position of the line designated to be the top margin; see decSTBM. Line numbers are relative to the top margin setting.

decSTBM SET TOP AND BOTTOM MARGINS (ESC [ Pn1 ; Pn2 r)

Sets top and bottom margins according to the parameters to define a scrolling region within the display page. Pn1 is the line number of the top line of the scrolling region. Pn2 is the line number of the bottom line of the scrolling region. Default is the entire page (ie, no margins).

#### SUGGESTED SETUP

The Ambassador can be programmed to execute a sequence of commands automatically at power-on; see Programmable Strings section. This may be used to initialize the terminal to make it act as closely as possible to the VT100. Suggested initializations (and the controls that effect them) follow.

To limit page size to 24 lines.

```
ESC [ 2 4 ; ; ; 2 4 p
```

To disable the ERASE, EDIT, DELETE, and INSERT keys.

```
ESC P ` > | | | | | ESC \
```

To program the PF1, PF2, PF3, PF4 keys to match the VT100.

```
ESC P ` H ~ [ O P | ~ [ O Q | ~ [ O R | ~ [ O S ESC \
```

To program the terminal's DA response to match the VT100.

```
ESC P ` $ ~ [ [ ? 1 ; 2 { C ESC \
```

These controls may be loaded into the power-on string as follows.

```

ESC P p
~ [ [ 2 4 ; ; ; 2 4 { P }
~ [ P { @ > \ \ \ \ \ \
@ } H { ^ } [ O P { \ ^ } [ O Q { \ ^ } [ O R { \ ^ } [ O S
{ @ $ ^ } [ [ ? 1 ; 2 { [ } C ~ [ \
ESC \

```

Note: This sequence is broken across several lines for clarity only.

If VT52 mode is desired at power-on, the RM control, ESC [ ? 2 1, may be included in the power-on string, but following all ANSI controls. (The ANSI controls will not function after VT52 mode is selected).

The power-on string can also be executed by the 2-key sequence, SETUP Z, or by the RIS control, ESC c. The string will not execute if the RESET key is held down. CTRL-SHIFT-RESET may be used to reset the terminal without executing the string.