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# **HDS200**

## **Pocket Reference Guide**

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**HDS** human designed systems, inc.

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This *HDS200 Pocket Reference Guide* contains lists of terminal functions, commands, and settings in a form designed to help you find information quickly. The *HDS200 User's Manual* and the *HDS200 Programmer's Reference Manual* provide supporting information for these tables and lists. Refer to the **Table Of Contents** below for a summary of material contained in this Guide.

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## Setup Mode Operation

Setup Mode is a feature of the HDS200 terminal for setting and changing the configuration of the terminal. Setup Mode uses keys with red keyfront legends. Setup Lines are displayed at the bottom of the screen in reverse video. Enter Setup Mode by pressing SETUP. Select a Setup Line by pressing NEXT LINE and select a field within the line (shown in normal video) by pressing the left arrow or the right arrow keys. Pressing the NEXT VALUE key selects each of the available values for the field in turn.

You can exit Setup Mode and keep the configuration selected by pressing SETUP at any time. This Setup configuration remains until you turn the power OFF or reset the terminal. You can save the configuration in NVM (Non Volatile Memory) for permanent storage by pressing SAVE twice. The NVM configuration is used after Reset or power ON.

## Returning To Factory Settings

The terminal can be reset and the factory configuration selected easily by pressing the META SHIFT RESET keys or by pressing the FACTRY RESET key twice when in Setup Mode. The factory settings of the terminal emulate the DEC VT102 terminal configuration.

## Setup Lines

Each Setup Line is shown below. Factory settings for each field appear as the field label. Factory settings for fields without label changes, such as Video, are given in the field description.

### General Setup Line # 1

80 Pgs Used:1 pg ASCII Video Cursor Click:Norm Bell:Norml Scroll:Jump
---

a	b	c	d	e	f	g	h
---	---	---	---	---	---	---	---

- 80 or 132 column display width.
- Pages of display memory used (window size).
- Character set in use.
- Video display, normal or reverse video. Factory Setting = normal.
- Cursor type: block/underline, fast/slow, blink/solid, or none. Factory Setting = fast blinking block.
- Keyclick volume, values Off, Soft, Normal, Loud.
- Bell volume, values Off, Soft, Normal, Loud, or Video.
- Scrolling method, either jump, smooth, or slow smooth scroll.

### General Setup Line # 2

Wrap:off Cursor Pad:Send New Line:off Mode:ANSI 7-bit Printer:DEC LA50
--

a	b	c	d	e
---	---	---	---	---

- Cursor and character wraparound Off or On.
- Cursor Pad in Send or Local Mode.
- New Line Mode Off or On.
- Operating mode of the terminal, either ANSI 7-bit, ANSI 8-bit, or VT52.
- Graphics printer configuration, either DEC LA50, Epson, C. Itoh, Anadex, Okidata, or Thinkjet.

### Communications Setup Line

Line 1 Full 9600 (Recv=Tran) Data/Parity:7/Spac Stops:1 XOFF:Snd/Rcv CTS:N/A

a b c d e f g h

- a) Communications line for settings, either Line 1, 2, or 3.
- b) Communications mode, Full, Local, Block, or Half.
- c) Baud rate for transmission.
- d) Baud rate for receiving line. Factory Setting = Same as transmit baud rate.
- e) Data bits (7 or 8) per character and transmitted parity bits.
- f) Stop bits.
- g) XON/XOFF protocol, either Send, Recv, None, or Snd/Rcv.
- h) CTS/RTS protocol, Need or N/A.

### User Defined Keys Setup Line

USER DEFINED KEYS: Press NEXT VALUE; key to change; type data; then NEXT VALUE

You can enter a key definition by pressing the NEXT VALUE key, then the key you want to redefine. Type in the new definition, either text or commands, and it will appear on the screen. You may enter up to 60 characters; more than 60 will be truncated. All characters, even non-printing control characters, are displayed. Edit the definition with the right arrow, left arrow, and F2 (DEL CHAR) keys. Save the new definition in NVM by pressing NEXT VALUE or restore the old definition by pressing NEXT LINE or SETUP. Refer to the User Defined Key Keychart for key numbers, factory definitions, and execute/transmit settings.

### Tab Setup Line

2345678.9012345.7890123.5678901.3456789.1234567.9012345.7890123.5678901.3456789.1234567.9012345.

Factory Settings are Tab stops at every eighth space. You can change the Tab settings, either On or Off, by using the right arrow and left arrow keys to move to the column you want, then press NEXT VALUE to toggle the Tab setting for that column.

## ANSI Terminal Commands

The terminal commands listed below are either control codes or command sequences. Control codes are generated from the keyboard by holding down the control key *CTRL* while pressing another key. Command sequences are generated from the keyboard by pressing the key labelled *CMD (SHIFT ESC)* and then typing the remainder of the sequence, substituting the numeric values corresponding to your parameter choices in the position of the parameters in the command sequence.

Command sequences must observe the following rules:

- Commands entered from the keyboard must use *CMD (SHIFT ESC)* for the ESC character. Commands executed from communication lines (for example, commands originating from a program running on the host computer) use ESC.
- Commands must be entered with no embedded spaces. Spaces are included in this listing for clarity only.
- Command parameters must be separated with semicolons, or colons where indicated, within the command sequence.
- The values entered for the parameters must be accepted values (refer to the notes and the parameter descriptions). Incorrect values cause the command to be ignored.
- Characters must be entered exactly as they are shown, noting the use of upper or lower case letters and other symbols.
- If a command can be executed with a single dedicated key, such as *RETURN* for CTRL M, that key is shown on the command line in underlined italics.

## Using Default Values

The term "Default value" has several meanings which are often confused. In general, a default value is the value used when no other value is specified. The default value for a parameter is the value (usually 0 or 1) which will be used if the parameter is not specified in the command sequence. The factory setting for a function may be different from the default value of the command parameter. For example, the command to set the Bell Volume uses the *bell* parameter with a default of 0 (*bell* = 0 is Bell OFF), but the factory setting (sometimes called the factory default) for the Bell Volume command has *bell* = 3. All factory settings of the terminal are detailed in a separate list in this Guide.

When you enter a command line and omit a parameter, the default value for that parameter is used when the command is executed. This is a convenient way to save steps if the default value is the choice you want. For commands with multiple parameters it may be necessary to mark the parameter field by entering the semicolons surrounding defaulted fields. For example, the Define Window command would be written: ESC [ ;;;40 w to use defaults for all the parameters except the last one.

## Using Terminal Processing Modes

Terminal Processing Modes are special kinds of command sequences. They allow a choice of two types of processing for a given situation, one type called the Set State and the other called the Reset State. The Set, or Reset, State of a processing mode is chosen by a Set, or Reset, command sequence with the mode number as the parameter. The processing mode commands use private parameters and mode numbers from three groups: ANSI, DEC, and HDS. The HDS group includes numbers for both the other groups for ease of use.

The Processing Mode commands are:

	ANSI group	DEC group	HDS group
Set State	ESC [ <i>ansi</i> h	ESC [ ? <i>dec</i> h	ESC [ = <i>hds</i> h
Reset State	ESC [ <i>ansi</i> l	ESC [ ? <i>dec</i> l	ESC [ = <i>hds</i> l

Note that the terminating letters are lowercase *h* and *l*. The parameters *ansi*, *dec*, and *hds* refer to the mode numbers as shown in the list. HDS modes include all ANSI and DEC modes. For example, ESC [ = 203 h is the same as ESC [ ? 3 h. Up to 15 mode

numbers separated by semicolons (either for ANSI, DEC, or HDS modes, for either Set or Reset commands, but not mixed) can be used in a single command sequence.

### Using Commands And Character Sets

Command sequences are recognized by the terminal as strings of ASCII codes. The codes or chart locations are represented in these manuals as characters from the ASCII character set. If you are using another character set, such as the APL, some characters that appear in these commands may not appear on your keyboard, or some characters used in both ASCII and APL character sets may be assigned different chart locations in those character sets. When you enter commands you must always use the ASCII codes and the chart locations of the ASCII characters as reference points for the command characters. The *HDS200 Programmer's Reference Manual* has complete command descriptions including ASCII chart locations for each command.

### BASIC TERMINAL OPERATIONS—General Commands

Command Name	** Notes	Command Sequence
Reset Terminal <i>also</i> <u>RESET</u>		ESC c
Halt Terminal <i>also</i> <u>HALT</u>		ESC a
Save NVM Configuration		ESC [ save ~
Reset NVM To Factory Settings <i>also</i> keys <u>META SHIFT RESET</u>		ESC [ 9 ~
Cancel Command Sequence—Display BLOT (Alternate)		CTRL X CTRL Z
Change Message Character		ESC [ msgchr;chr;chr! t
Fill Character (Alternate) <i>also</i> <u>DEL</u>		CTRL @ RUB
Allocate Printer Buffer		ESC [ pages + u
Enter Setup Mode <i>also</i> <u>SETUP</u>		ESC ;
Self Test		ESC [ testy
Screen Alignment Pattern		ESC # 8
VT52 Mode Operation	(1)	ESC [ ? 2

*chr* ASCII chart location of character to be used (000–127).  
If the *chr* parameter is omitted, the message character to which it applies is not used. **Default = 000.**

*msgchr* Message character to change:

<i>msgchr</i>	Meaning	Factory Setting	No. Chars.
0	Escape	CTRL [ (027)	1
1	Start of Message	Not used	1
2	Function Key ID	CTRL \ (028)	1
3	Alt. Grphx Exit Chr	Not used	1
4	Delay Character	Not used	1
5	End of Field	CTRL W (023)	2
6	End of Line	CTRL M (013)	2
7	End of Message	CTRL M (013)	2

*pages* Number of pages to be used for display memory. The remaining pages are used as printer buffer. **Default = maximum display memory, 4 or 8 pages.**

*save* **0 = Save all terminal settings in NVM**  
**9 = Reset NVM to factory settings**

*test* Test(s) to be performed:  
**0 = Memory** (error codes: 1-4 = ROM chip; 6 = RAM; 7 = NVM)  
**1 = Communications** (error code: 8 = test failed)  
**2 = Character/attribute display**  
**4 = Graphics fill pattern display**  
**5 = Dimmed display**  
**9 = Repeat test(s) until error occurs or RESET key is struck.**

**\*\* Notes:**

(1) The Set State of this processing mode, **ESC [ ? 2 h**, will not return the terminal to ANSI mode operation because the terminal is operating in VT52 mode which doesn't recognize commands in that form. The VT52 mode command to return to ANSI mode operation is **ESC <**

**BASIC TERMINAL OPERATIONS—Keyboard Commands**

Command Name	** Notes	Command Sequence
Lock Keyboard (Alternate)		ESC ^
Unlock Keyboard		ESC [ 2 h
Ring Keyboard Bell	= 112	ESC b
Keyboard Bell On		CTRL G
Keyboard Bell Off		ESC [ = 112 h
Keyboard LED Control		ESC [ = 112 l
Meta Key Operation		ESC [ <i>led</i> q
		ESC [ <i>meta</i> + x

*led*     **0 = Turn off keyboard indicator light L1**  
1 = turn on L1

*meta*   **0 = Ignore meta key**  
1 = send ESC before next key  
2 = send next key with 8th data bit on.

**\*\* Notes**   MODES AFFECTING PROCESSING—(Reset/Set = l/h)  
= 112   Keyboard Bell (Off/On)

**BASIC TERMINAL OPERATIONS—User Preference Commands**

Command Name	** Notes	Command Sequence
Smooth Scroll Speed	?4	ESC [ <i>sspeed</i> + t
Smooth Scroll		ESC [ ? 4 h
Jump Scroll		ESC [ ? 4 l
Cursor Type		ESC [ <i>cursor</i> + {
Block Cursor Type		ESC [ = 119 h
Underline Cursor Type		ESC [ = 119 l
Keyboard Volume Control	= 112	ESC [ <i>bell;click!</i> }
Normal Screen Video		ESC [ ? 5 l
Reverse Screen Video		ESC [ ? 5 h

*bell*     Volume of keyboard bell.  
**0 = off**  
1-7 = increasing volume  
8 = visual bell (flashing screen video), applies to bell parameter only.

*click*    Volume of key click. See bell, except 8 = visual bell is not allowed.  
**Default = 0.**

*cursor*   **0 = block cursor (blink)**  
1 = underline cursor (blink)  
2 = block cursor (slow blink)  
3 = underline cursor (slow blink)  
4 = block cursor (no blink)  
5 = underline cursor (no blink)  
6 = do not display cursor.

*sspeed*   Smooth scrolling speed: **0 = disabled (jump scroll)**; 1 = slow;  
2 = normal.

**\*\* Notes**   MODES AFFECTING PROCESSING—(Reset/Set = l/h)  
= 112   Keyboard Bell (Off/On)  
?4   Smooth Scroll (Jump/Smooth)

**COMMUNICATIONS—Communications Setup Commands**

Command Name	** Notes	Command Sequence
Remote Mode Processing		ESC [ = 111 l
Local Mode Processing		ESC [ = 111 h
Character Mode Processing		ESC [ = 110 l
Block Mode Processing		ESC [ = 110 h
Half Duplex Processing		ESC [ 12 l
Full Duplex Processing		ESC [ 12 h
Parity-Data Bits/Parity Checking		ESC [ <i>par</i> ; <i>check</i> ; <i>devcm</i> * p
Set Baud Rate		ESC [ <i>tbaud</i> ; <i>rbaud</i> ; <i>devcm</i> * r
Set Stop Bits		ESC [ <i>sbit</i> ; <i>devcm</i> * s
CTS/RTS (Transmit) Protocol		ESC [ <i>xmit</i> ; <i>devcm</i> * x
Buffer Overflow (Receive) Protocol		ESC [ <i>buff</i> ; <i>devcm</i> * q
Host Overflow (Transmit) Control		ESC [ <i>hctl</i> ; <i>devcm</i> * {
Stop Transmission		CTRL S
Resume Transmission		CTRL Q
Toggle No Scroll <i>also NO SCROL</i>		ESC 9
Break Transmission <i>also BREAK</i>	= 111	ESC [ 0; <i>devcm</i> * ~
Disconnect Transmission <i>also SHIFT BREAK</i>	= 111	ESC [ 1; <i>devcm</i> * ~
Limit Transmit Rate		ESC [ <i>offon</i> ; <i>devcm</i> + y
Select 7/8 Bit ANSI Mode		ESC [ <i>numbit</i> '' p

*buff*     **0 = None**; 1 = Send XON(CTRL Q)/XOFF(CTRL S)

*check*    **0 = No parity checking on input**; 1 = Parity checking on input.

*devcm*    **0 = Requesting device or Main Communication Device if requesting device is the keyboard**; 1 = Line 1; 2 = Line 2; 3 = Line 3.

*hctl*     **0 = Terminal ignores XOFF (CTRL S) received from Line *devcm***;  
1 = Terminal responds to XON/XOFF from Line *devcm*.

*numbit*   **61 = 7 bit ANSI operation**  
62 = 8 bit ANSI operation. 0 = illegal value.

*offon*    Limit transmission rate: **0 = no**; 1 = yes.

*par*       7 data bits: **0 = No parity sent**, 1 = Even, 2 = Odd,  
                  3 = Mark, 4 = Space  
8 data bits: 5 = No parity sent, 6 = Even, 7 = Odd,  
                  8 = Mark, 9 = Space

*rbaud*    See *tbaud* for available values. **Default = Same value as *tbaud***.

*sbit*      **0 or 1 = one stop bit**; 2 = two stop bits.

*tbaud*    **0 = reserved**     4 = 150            8 = 1800            12 = 4800  
1 = 75                5 = 300            9 = 2000            13 = reserved  
2 = 110               6 = 600            10 = 2400           14 = 9600  
3 = 134.5            7 = 1200           11 = reserved      15 = 19,200

*xmit*      **0 = CTS not required for transmissions, RTS always held high**;  
1 = CTS must be held high for transmission over the line, RTS only held high if a device is networked to requesting device.

\*\* Notes   **MODES AFFECTING PROCESSING—(Reset/Set = l/h)**  
= 111    Remote/Local Mode (Remote/Local)

**COMMUNICATIONS—Networking/Printing Commands**

Command Name	** Notes	Command Sequence
Print/Line 3 Control	?18, ?19, = 115, = 116, = 117, = 129	ESC [ <i>media</i> i
No Print Termination Character		ESC [ ? 18 l
(Alternate)		ESC [ = 117 l
Form Feed Print Termination Character		ESC [ ? 18 h
(Alternate)		ESC [ = 117 h
Printer Extent—Scrolling Region		ESC [ ? 19 l
Printer Extent—Window		ESC [ ? 19 h
Print All Character Sets		ESC [ = 129 h
Ignore Character Sets In Printing		ESC [ = 129 l
Set Output Network		ESC [ <i>output:dev</i> t
Set Keyboard Communication Device		ESC [ <i>kbddev</i> z
Select Attribute List		ESC [ <i>alist;dev</i> ! u
Copy Attribute List		ESC [ <i>alist;dev</i> ! v

*alist*      Number of attribute list used; 1, 2, 3, or 4.

*dev*        **0 = Requesting device**; 1 = Line 1; 2 = Line 2; 3 = Line 3; 9 = Keyboard.

*kbddev*    **0 or 1 = Line 1**; 2 = Line 2; 3 = Line 3.

*media*      **0 = Print (SHIFT F7)** (Extent depends on HDS mode 219)

?1 = Print cursor line

2 = Send to Line 3

4 = Printer controller off

5 = Printer controller on

?4 = Auto Print off (SHIFT F6)

?5 = Auto Print on (F6)

6 = Detach Line 3

7 = Attach Line 3

= 8 = Print cursor line

= 9 = Print window to cursor position (F7)

Parameters 1, 4, and 5, when used with "?", execute the specific commands shown. Parameters 8 and 9 require "=" before the entire parameter string.

*output*     **0 = None**; 1 = Line 1; 2 = Line 2; 3 = Line 3; 9 = Display.

\*\* Notes    **MODES AFFECTING PROCESSING—(Reset/Set = l/h)**

?18    Print Termination Character (None/Form Feed)

?19    Printer Extent (Scrolling Region/Window)

= 115   Underline Transmission (Transmit/Suppress)

= 116   Transmit Initiation (Window/Start Of Print)

= 117   Print Termination Character (None/Form Feed)

= 129   Print Character Sets (Ignore Sets/Print All Sets)

**COMMUNICATIONS—Block Mode Transmission Commands**

Command Name	** Notes	Command Sequence
Transmit 1,16, = 111, = 114, = 115, = 116, = 128 <i>also F5</i>		ESC 5
Transmit Unprotected Characters Only		ESC [ 1 l
Transmit All Characters		ESC [ 1 h
Set Transmit Termination—End Of Area		ESC [ 16 h
Set Transmit Termination—Cursor Position		ESC [ 16 l
Transmit Trailing Spaces		ESC [ = 114 l
Suppress Trailing Spaces		ESC [ = 114 h
Transmit Underline Attribute		ESC [ = 115 l
Suppress Underline Attribute		ESC [ = 115 h
Set Transmit Initiation—Window		ESC [ = 116 h
Set Transmit Initiation—Start Of Print		ESC [ = 116 l
Block Transmission Restricted		ESC [ = 128 l
Block Transmission Unrestricted		ESC [ = 128 h
Set Transmit Extent		ESC [ <i>trmext</i> * y
Set Transmit Delay		ESC [ <i>dly</i> * z
Start of Print/Transmit		ESC ?

*dly* In 100 millisecond units: **0 = no delay**

*trmext* Transmit extent: **0 = window**; 1 = line; 3 = field.

\*\* Notes MODES AFFECTING PROCESSING—(Reset/Set = l/h)

1 Transmit (Unprotected/All)

16 Transmit Termination (End Of Area/Cursor Position)

= 111 Remote/Local Mode (Remote/Local)

= 114 Trailing Spaces On Output (Transmit/Suppress)

= 115 Underline Attribute Processing (Transmit/Suppress)

= 116 Transmit Initiation (Window/Start Of Print)

= 128 Block Transmit Security (Restricted/Unrestricted)

**DISPLAYING CHARACTERS—Character Set Commands**

Command Name	** Notes	Command Sequence
Define G0 Character Set		ESC ( <i>cset</i>
Define G1 Character Set		ESC ) <i>cset</i>
Define G2 Character Set		ESC * <i>cset</i>
Define G3 Character Set		ESC + <i>cset</i>
Lock Shift G0 into GL	= 101 for HDS201	CTRL O
Lock Shift G1 into GL	= 101 for HDS201	CTRL N
Lock Shift G2 into GL		ESC n
Lock Shift G3 into GL		ESC o
Lock Shift G1 into GR		ESC ~
Lock Shift G2 into GR		ESC }
Lock Shift G3 into GR		ESC
Single Shift G2 into GL		ESC N
Single Shift G3 into GL		ESC O
Load RAM Character Set		ESC P <i>chnum</i> p <i>ptrn</i> ESC \
Erase RAM Character Set		ESC 4

*chnum* Starting character number (ASCII chart location) to be defined. **Default = 032 (space).**

*cset* B = ASCII Character Set

0 = VT100 and Special Graphics Character Set

1 = nroff/scientific Character Set

3 = RAM (user-definable) Character Set

< = International Character Set

Note that *cset* cannot be omitted but must have a character entered. All other values of *cset* select B (ASCII).

*ptrn* ASCII hexadecimal pattern of dots on/off.

\*\* Notes MODES AFFECTING PROCESSING—(Reset/Set = l/h)

= 101 ASCII/APL Overstrike Processing (ASCII/APL)

**DISPLAYING CHARACTERS—Display Attribute Commands**

Command Name	** Notes	Command Sequence
Single Width Line		ESC # 5
Double Width Line		ESC # 6
Double Height/Double Width-Top Line		ESC # 3
Double Height/Double Width-Bottom Line		ESC # 4
Attribute Control		ESC [ <i>blink;undlin +</i> }
Select Alternate Attributes	= 127	ESC [ <i>atalt m</i>
Select Default Attributes	= 127	ESC [ <i>atdef!</i> {
Set Normal/Bold Attribute		ESC [ = 127 l
Set Half-bright/Normal Attribute		ESC [ = 127 h
Select Attribute List		ESC [ <i>alist;dev! u</i>
Copy Attribute List		ESC [ <i>alist;dev! v</i>
Block Attribute Change	= 120	ESC [ <i>atusd:atalt:atlns;atcls! q</i>
Block Character Change	(1)	ESC [ <i>chr;rptcls;rptlns p</i>
Protection On		ESC V
Protection Off		ESC W
Protected Field Display		ESC [ = 118 l
Protected Field Display Bold	= 127	ESC [ = 118 h

*alist* Number of attribute list used; 1, 2, 3, or 4.

*atalt* Attributes set to alternate state. **0 = all to default state.**

Attribute	Default	Alternate
1 (see **)	Normal brightness	Bold
2 (see **)	Half bright	Normal
4	No underline	Underline
5	Non-blinking	Blinking
7	Normal video	Inverse video
8	Displayable	Not displayable
= 99	No protection	Protection

Using attribute 99 requires an equal sign "=" before entire list.

\*\* Note that attributes 1 and 2 depend on HDS mode 127. If mode 127 is Set, 1 is illegal and 2 is half bright; if mode 127 is Reset, 1 is bold and 2 is illegal.

*atcls* Number of columns affected by attribute change, not more than columns in window **Default = number of columns to right of cursor in window.**

*atdef* Attributes set to default state, refer to *atalt* for listings. **0 = none to default state.**

*atlns* Number of lines affected by attribute change, not more than window or scrolling region **Default = number of lines below cursor in window.**

*atusd* Attributes changed by this command. Refer to *atalt* for listings.

*blink* Blinking character attribute: **0 = fast**; 1 = slow.

*chr* ASCII chart location of character (**000–127**)

*dev* **0 = Requesting device**; 1 = Line 1; 2 = Line 2; 3 = Line 3; 9 = Keyboard.

*rptcls* Number of columns affected by character change. **Default = 1.**

*rptlns* Number of lines affected by character change. **Default = 1.**

*undlin* Underline attribute position in character cell. **0 = normal**; 1 = top; 2 = middle; 3 = bottom.

\*\* Notes **MODES AFFECTING PROCESSING—(Reset/Set = l/h)**

= 120 Character/Attribute Replacement (Both/Character)

= 127 Set Normal Attribute (Normal,bold/half-bright,normal)

(1) Control characters (ASCII 000–031, 127) may be displayed with this command.

**DISPLAYING CHARACTERS—Character Processing Commands**

Command Name	** Notes	Command Sequence
Transparent Mode On (Alternate)		ESC Q ESC [ 3 h
Transparent Mode Off (Alternate)	(1)	ESC R ESC [ 3 l
Set Margin Bell		ESC [ <i>offset</i> ! y
Toggle Insert Mode <i>also INSERT</i>		ESC I
Replace Character Mode		ESC [ 4 l
Insert Character Mode		ESC [ 4 h
Toggle Caps Lock <i>also CAPS LOCK</i>		ESC 6
Caps Lock On		ESC [ = 109 h
Caps Lock Off		ESC [ = 109 l
Auto Tabs Off		ESC [ = 106 l
Auto Tabs On		ESC [ = 106 h
Don't Overwrite Protected Fields		ESC [ = 108 l
Overwrite Protected Fields		ESC [ = 108 h
Replace Character And Attribute		ESC [ = 120 l
Replace Character Only		ESC [ = 120 h
Underline Processing As Attribute		ESC [ = 121 l
Underline Processing As Character		ESC [ = 121 h
HDS-style Auto Wraparound		ESC [ = 124 l
DEC-style Auto Wraparound		ESC [ = 124 h
Character Wraparound Off		ESC [ ? 7 l
Character Wraparound On		ESC [ ? 7 h

*offset* Column position from right margin at which keyboard bell sounds; **0 = no margin bell.**

\*\* Notes:

(1) This command operates only from the keyboard as **CMD [ 3 l**.

**TEXT MANIPULATION—Tabular Movement Commands**

Command Name	** Notes	Command Sequence
Tab <i>also TAB</i>	= 105	CTRL I
Text Tab Processing		ESC [ = 105 l
Forms Tab Processing		ESC [ = 105 h
Forward Tab	= 105	ESC [ <i>repeat</i> l
Backward Tab <i>also SHIFT TAB</i>	= 105	ESC [ <i>repeat</i> Z
Set Tab		ESC H
Clear Tabs		ESC [ <i>clrtab</i> g
Tab Control		ESC [ <i>tabctl</i> W

*clrtab* **0 = Clear text tab stop at cursor position**  
 3 = Clear all text tab stops  
 = 0 = reset text tab stops to Factory Setting, every 8 columns.

*repeat* Number of times a command is to be repeated. **Default = 1.**

*tabctl* **0 = Set text tab at current cursor column position**  
 2 = Clear text tab stop at current cursor column position  
 4 or 5 = Clear all text tab stops.

\*\* Notes **MODES AFFECTING PROCESSING—(Reset/Set = l/h)**  
 = 105 Tab Processing (Text/Form)

**TEXT MANIPULATION—Cursor Movement Commands**

Command Name	** Notes	Command Sequence
Carriage Return <i>also RETURN</i>	20, = 104	CTRL M
Line Feed <i>also LINE FEED</i>	20, = 104	CTRL J
Line Feed Processing		ESC [ 20 l
New Line Processing (CR/LF)		ESC [ 20 h
Vertical Tab (line feed)	= 104	CTRL K
Scrolling (Line Feed) On		ESC [ = 104 l
Scrolling (Line Feed) Off		ESC [ = 104 h
Form Feed	?6, = 122	CTRL L
Backspace <i>also BACK SPACE</i>	?6, = 107	CTRL H
Index	= 104	ESC D
Reverse Index	= 104	ESC M
New Line	= 104	ESC E
Cursor Up <i>also up arrow</i>	= 107	ESC [ <i>repeat</i> A
Cursor Down <i>also down arrow</i>	= 107	ESC [ <i>repeat</i> B
(Alternate)	= 107	ESC [ <i>repeat</i> e
Cursor Right <i>also right arrow</i>	= 107	ESC [ <i>repeat</i> C
(Alternate)	= 107	ESC [ <i>repeat</i> a
Cursor Left <i>also left arrow</i>	= 107	ESC [ <i>repeat</i> D
Cursor Up-Left Margin	= 107	ESC [ <i>repeat</i> F
Cursor Down-Left Margin	= 107	ESC [ <i>repeat</i> E
Home Cursor <i>also home arrow</i>	?6	ESC H
Position Cursor	?6	ESC [ <i>lin</i> ; <i>col</i> H
(Alternate)	?6	ESC [ <i>lin</i> ; <i>col</i> f
Position Cursor-Column		ESC [ <i>col</i> G
(Alternate)		ESC [ <i>col</i> ^
Position Cursor-Line	?6	ESC [ <i>lin</i> d
Cursor Wraparound Off		ESC [ = 107 l
Cursor Wraparound On		ESC [ = 107 h
Cursor Addressing—Window		ESC [ ? 6 l
Cursor Addressing—Scrolling Region		ESC [ ? 6 h
End of Text	?6	ESC 2
Transmit Cursor Position	?6, = 111	ESC [ 6 n
Save Cursor	?6	ESC 7
Restore Cursor	?6	ESC 8

*col* Column position, **Default = leftmost column in window or scrolling region**. Values larger than defined window yield number of columns in window.

*lin* Line position, **Default = top line in window or scrolling region**. Values larger than defined window yield number of lines in window.

*repeat* Number of times a command is to be repeated. **Default = 1**.

\*\* Notes MODES AFFECTING PROCESSING—(Reset/Set = l/h)

?6 Cursor Addressing (Window/Scrolling Region)

20 Line Feed Processing (LF/New Line)

= 104 Scrolling Line Feed (On/Off)

= 107 Cursor Wraparound (Off/On)

= 111 Remote/Local Mode (Remote/Local)

**TEXT MANIPULATION—Editing Commands**

Command Name	** Notes	Command Sequence
Insert Character		ESC [ <i>repeat</i> @
Delete Character <i>also F2</i>	= 120	ESC [ <i>repeat</i> P
Insert Line <i>also F3</i>	?6, = 104	ESC [ <i>repeat</i> L
Delete Line <i>also SHIFT F3</i>	?6, = 104	ESC [ <i>repeat</i> M
Erase in Window <i>also SHIFT F4</i>	6, = 120	ESC [ <i>erase</i> J
Erase in Line <i>also F4</i>	6, = 120	ESC [ <i>erase</i> K
Erase in Field	6, = 120	ESC [ <i>erase</i> O
Erase Protected Characters		ESC [ 6 h
Don't Erase Protected Characters		ESC [ 6 l
Form Feed	?6, = 122	CTRL L
Form Feed Processing—Clear Screen		ESC [ = 122 I
Form Feed Processing—Index (LF)		ESC [ = 122 h
Set Clear Characteristics		ESC [ <i>atusd:atalt:chr! r</i>
Copy Window		ESC [ <i>srcw;dstw + q</i>
Select Editing Extent		ESC [ <i>extent</i> Q

*atalt* Attributes to be set to alternate state; **0 = Set all attributes to default state.**

Attribute	Default	Alternate
1 (see **)	Normal brightness	Bold
2 (see **)	Half bright	Normal
4	No underline	Underline
5	Non-blinking	Blinking
7	Normal video	Inverse video
8	Displayable	Not displayable
=99	No protection	Protection

Using attribute 99 requires an equal sign "=" before entire list.

\*\* Note that attributes 1 and 2 depend on HDS mode 127. If mode 127 is Set, 1 is illegal and 2 is half bright; if mode 127 is Reset state, 1 is bold and 2 is illegal.

*atusd* Attributes changed by this command. Refer to *atalt* for listings.

*chr* ASCII chart location of character (000–127).

*dstw* Destination window number for copy: 1, 2, 3, or 4.

*erase* **0 = Erase from cursor to end of field, line, or window**  
 1 = Erase from beginning of field, line, or window to cursor, inclusive  
 2 = Erase entire field, line, or window.

*extent* **0 = Insert/delete characters in window**  
 1 = Insert/delete characters in line  
 3 = Insert/delete characters in field. Combining 1 and 3 results in the extent being field, except that insertion/deletion in line occurs for multiline fields.

*repeat* Number of times a command is to be repeated. **Default = 1.**

*srcw* Source window number for copy: 1, 2, 3, or 4.

\*\* Notes MODES AFFECTING PROCESSING—(Reset/Set = l/h)

6 Erase Protected Characters (No/Yes)

?6 Cursor Addressing (Window/Scrolling Region)

= 104 Scrolling (Line Feed) (On/Off)

= 120 Character/Attribute Replacement (Both/Character)

= 122 Form Feed Processing (Clear Screen/Index)

## SCREEN AND WINDOW MANAGEMENT COMMANDS

Command Name	** Notes	Command Sequence
Scroll Down <i>also</i> <u>SCROL</u>		ESC [ <i>repeat</i> T
Scroll Up <i>also</i> <u>SHIFT SCROL</u>		ESC [ <i>repeat</i> S
Page Down <i>also</i> <u>PAGE</u>		ESC [ <i>repeat</i> U
Page Up <i>also</i> <u>SHIFT PAGE</u>		ESC [ <i>repeat</i> V
Set Top of Screen		ESC [ <i>lin</i> ! s
Set 80 Column Display—Preserve Memory		ESC [ = 103 l
Set 80 Column Display—Clear Memory		ESC [ ? 3 l
Set 132 Column Display—Preserve Memory		ESC [ = 103 h
Set 132 Column Display—Clear Memory		ESC [ ? 3 h
Define Scrolling Region		ESC [ <i>top</i> ; <i>bot</i> r
Maximum Scrolling Region		ESC [ r
Define Window		ESC [ <i>top</i> ; <i>bot</i> ; <i>lft</i> ; <i>rgt</i> w
Maximum Window		ESC [ w
Select Window		ESC [ <i>win</i> ; <i>dev</i> ! w
Define Viewport		ESC [ <i>tline</i> ; <i>bline</i> ; <i>win</i> ; <i>drag</i> ; <i>vport</i> + w
Clear Viewport Definition		ESC [ + w
Select Viewport		ESC [ <i>vport</i> ; <i>dev</i> + v

*bline* Bottom line on screen (1-24). **Default = 24.**

*bot* Bottom line of window or scrolling region. For scrolling region, the default is the bottom of the window; for window, the default is the maximum of display memory.

*dev* **0 = Requesting device;** 1 = Line 1; 2 = Line 2; 3 = Line 3; 9 = Keyboard.

*drag* Automatic scroll of viewport to follow cursor: **0 = drag on;** 1 = drag off.

*lft* Leftmost column position of window. **Default = 1.**

*lin* **Line position beginning with 1, 0 is treated as 1.** Values outside of the window definition are treated as the bottom position in the window or scrolling region.

*repeat* Number of times a command is to be repeated. **Default = 1.**

*rgt* Rightmost column position of window. **Default = screen maximum.**

*tline* Top line on screen (1-24). **Default = 1.**

*top* Topmost line of window or scrolling region. **Default = 1;** for scrolling region, line 1 is the top line of the window.

*win* Window number: 1, 2, 3, or 4.

*vport* Viewport number: 1, 2, 3, or 4.



**STATUS INFORMATION COMMANDS**

Command Name	** Notes	Command Sequence
Display Status Line		ESC [ <i>devst</i> ; <i>sline</i> * u
Scroll Status Line <i>also STATUS</i>		ESC [ * u
Transmit Status Line	= 111	ESC [ <i>dev</i> ; <i>sline</i> ; <i>beg</i> ; <i>end</i> * t
Toggle/Clear Status Line		ESC [ <i>tcs</i> * v
Transmit Terminal ID	(1), = 111, = 123	ESC [ 0 c
Alternate	(1), = 111, = 123	ESC Z
VT102 Terminal Identifier		ESC [ = 123 I
HDS200 Terminal Identifier		ESC [ = 123 h
Transmit Device Status	(2), = 111	ESC [ 5 n
Transmit Printer Status	(3), = 111	ESC [ ? 15 n
Set Background Status Line		ESC [ <i>bkg</i> * w
Transmit Answerback Message	= 111, = 128	CTRL E
Alert Line Display—Automatic		ESC [ = 113 I
Alert Line Display—On Request		ESC [ = 113 h

*beg* Beginning column of Status Line transmission: 1 to 132.

*bkg* **0** = Blank; 1-4 = Cursor line of window 1-4.

*dev* **0** = **Requesting device**; 1 = Line 1; 2 = Line 2; 3 = Line 3; 9 = Keyboard.

*devst* **0** = **Scroll**; 1 = Line 1; 2 = Line 2; 3 = Line 3; 9 = Keyboard.

*end* Ending column position for Status Line transmission: 1 to **132**.

*sline* **0 or 1** = **General**  
 2 = Communications  
 3 = Graphics  
 4 = Programmer  
 5 = Modes  
 6 = Tabs  
 7 = Message Character  
 8 = Alert Line  
 9 = Viewport Status Lines.

*tcs* **0** = **Toggle between General Status Line and Clear**  
 1 = Clear.

\*\* Notes **MODES AFFECTING PROCESSING**—(Reset/Set = I/h)

= 111 Remote/Local Mode (Remote/Local)

= 123 Terminal Identifier (VT102/HDS200)

= 128 Block Transmit Security (Restricted/Unrestricted)

(1) Terminal Identification response is:

with Mode 123 Reset: ESC [ ? 6 c (VT102)

with Mode 123 Set: ESC [ = 4;1 c (HDS200,4 pg memory)

ESC [ = 4;2 c (HDS200,8 pg memory)

ESC [ = 5;1 c (HDS200G,4 pg memory)

ESC [ = 5;2 c (HDS200G,8 pg memory)

ESC [ = 6;2 c (HDS201,8 pg memory)

ESC [ = 7;2 c (HDS201G,8 pg memory)

(2) Terminal response is ESC [ 0 n

(3) Terminal response for Line 2 is:

for CTS signal low ESC [ ? 11 n

for CTS signal high ESC [ ? 10 n

## Terminal Processing Modes

Mode Numbers			Description of Feature	Reset State ESC [ = hds l	Set State ESC [ = hds h
ANSI	DEC	HDS			
1		= 1	Transmit Unprotected/All	Unprotected	<b>All</b>
2		= 2	Keyboard Lock	<b>Unlocked</b>	Locked
3		= 3	Transparent Mode	<b>Execute</b>	Display Only
4		= 4	Replace/Insert Characters	<b>Replace</b>	Insert
6		= 6	Erase Protected Characters	No	<b>Yes</b>
12		= 12	Full/Half Duplex	Half Duplex	<b>Full Duplex</b>
16		= 16	Transmit Termination	<b>End of Area</b>	Cursor Position
20		= 20	Line Feed Processing	<b>Line Feed</b>	New Line (LF/CR)
		= 101	ASCII/APL	<b>ASCII</b>	APL
		= 103	Display Width (HDS)	<b>80 columns</b>	132 columns
		= 104	Scrolling (Line Feed)	<b>On</b>	Off
		= 105	Tab Processing	<b>Text</b>	Form
		= 106	Auto Tabs	<b>Off</b>	On
		= 107	Cursor Wraparound	<b>Off</b>	On
		= 108	Protected Field Overwrite	<b>Not allowed</b>	Allowed
		= 109	Caps Lock	<b>Upper/lower</b>	Caps lock
		= 110	Character/Block Transmit	<b>Character</b>	Block
		= 111	Remote/Local	<b>Remote</b>	Local
		= 112	Keyboard Bell	Off	<b>On</b>
		= 113	Alert Line Display	<b>Automatic</b>	On request
		= 114	Trailing Spaces on Output	Transmit	<b>Suppress</b>
		= 115	Underline Transmission	<b>Transmit</b>	Suppress
		= 116	Transmit Initiation	<b>Window</b>	Start Print
		= 117	Print Termination Character	None	<b>Form Feed</b>
		= 118	Protected Field Display	<b>As Specified</b>	Bold
		= 119	Cursor Representation	Underline	<b>Block</b>
		= 120	Character/Attribute Replacement	<b>Both</b>	Character Only
		= 121	ASCII Underline on Input	Attribute	<b>Character</b>
		= 122	Form Feed Processing	Clear Screen	<b>Index (LF)</b>
		= 123	Terminal Identifier	<b>VT102</b>	HDS200
		= 124	Auto Wraparound	HDS-style	<b>DEC-style</b>
		= 125	Auto Blanking	Display	<b>Blanked</b>
		= 126	APL Overstrike Storage	No Overstrikes	<b>Overstrikes stored</b>
		= 127	Set Normal Attribute	<b>Normal/bold</b>	Half bright/normal
		= 128	Block Transmit Security	Restricted	<b>Unrestricted</b>
		= 129	Print Character Set	Ignore Sets	<b>Print All Sets</b>
	?1	= 201	Cursor Pad Operation	<b>Normal</b>	Application
	?2	= 202	ANSI/VT52 Compatibility	VT52	<b>ANSI</b>
	?3	= 203	Display Width (DEC)	<b>80 columns</b>	132 columns
	?4	= 204	Smooth Scroll	<b>Jump</b>	Smooth
	?5	= 205	Screen Video	<b>White on black</b>	Black on White
	?6	= 206	Cursor Addressing	<b>Window-relative</b>	Scroll region-relative
	?7	= 207	Character Wraparound	<b>Off</b>	On
	?18	= 218	Print Termination Character	None	<b>Form Feed</b>
	?19	= 219	Printer Extent	Scrolling Region	<b>Window</b>

**Bold face** indicates the factory setting for the processing mode.

Terminal Processing Modes are special kinds of command sequences. They allow a choice of two types of processing for a given situation, one type called the Set State and the other called the Reset State. The Set, or Reset, State of all processing modes is chosen by a Set, or Reset, command sequence with the mode number used as a parameter in the command. The processing mode commands use private parameters

and mode numbers from three groups: ANSI, DEC, and HDS. The HDS group includes numbers for both the other groups for ease of use.

The Processing Mode commands are:

	ANSI group	DEC group	HDS group
Set State	ESC [ <i>ansi</i> h	ESC [ ? <i>dec</i> h	ESC [ = <i>hds</i> h
Reset State	ESC [ <i>ansi</i> l	ESC [ ? <i>dec</i> l	ESC [ = <i>hds</i> l

Note that the terminating letters are lowercase *h* and *l*, and that a private parameter (= for *hds* parameters and ? for *dec* parameters) must be used in the command sequence with HDS or DEC mode number parameters. The parameters *ansi*, *dec*, and *hds* refer to the mode numbers as shown in the list. HDS modes include all ANSI and DEC modes. For example, **ESC [ = 203 h** is the same as **ESC [ ? 3 h**. Up to 15 mode numbers separated by semicolons (either for ANSI, DEC, or HDS modes, or for Set or Reset commands, but not mixed) can be used in a single command sequence.

### User Defined Keys (*next pages*)

You can enter a definition for a key in two ways, either by using Setup Mode, or by using the Program User Defined Key command. The total definition space available is 110 definitions and about 375 characters, excluding default settings.

You can enter a key definition in Setup Mode by scrolling to the User Defined Keys Line, then pressing NEXT VALUE and the key you want to define. Next type in the new definition, either text or commands, and it will appear on the screen. You may enter up to 60 characters; more than 60 will be truncated. All characters, even non-printing control characters, are displayed. Edit the definition with the right arrow, left arrow, and F2 (DEL CHAR) keys. Save the new definition in NVM by pressing NEXT VALUE or restore the old definition by pressing NEXT LINE or SETUP. All keys programmed in Setup Mode are set as Execute keys and the definitions stored in NVM.

The Program User Defined Keys command, **ESC [ key;actn;nvm u del msg del**, uses the following parameters (refer to the command listing for details):

- key* = the key number
- actn* = the action (execute, transmit, echo, disable, etc.)
- nvm* = RAM (temporary storage) or NVM (permanent storage)
- del msg del* = the message marked by arbitrary delimiter characters

This command defaults to RAM storage and is often used for program controlled redefinition of function keys. If both RAM and NVM definitions are given, the RAM definitions take precedence.

The keychart shown below gives general and technical information about the user defined keys. The left hand column gives the name of the key and the two blocks on the right side show pertinent information for that key in its default execute and default transmit settings. In simple terms, "Execute" means that the assigned definition on the key is performed just as if the characters in the definition had been entered on the keyboard. "Transmit" means that the terminal sends the assigned string of characters to the communication line, with no immediate effect on the terminal. All definitions you enter from Setup Mode are set as Execute definitions. Execute and Transmit status for each key can be set with the Program User Defined Key command. For discussion of that and related commands and more detailed definitions of execute and transmit operation, refer to the *HDS200 Programmer's Reference Manual*.

Note that some of these definitions, particularly the Transmit sequences, send different characters depending on the operating mode of the key or the terminal. The key definitions used for VT52 mode operation appear in the VT52 Mode section of this Guide.

Factory Settings for programmable characters:

- Function Key ID (FKID) = 028
- Programmable Escape (ESC) = 027
- End Of Message (EOM) = 013

The escape sequence character is uppercase O, not zero.

User Defined Key Label	Key No.	Def. Execute Definitions	Def. Transmit Definitions
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### UNSHIFTED FUNCTION KEYS F1 to F23

All keys	0		
F Keys group	90		
F1	1	Toggle Insert	(FKID)001(EOM)
F2	2	Delete Char	(FKID)002(EOM)
F3	3	Insert Line	(FKID)003(EOM)
F4	4	Erase Line	(FKID)004(EOM)
F5	5	Send	(FKID)005(EOM)
F6	6	Auto Print On	(FKID)006(EOM)
F7	7	Print Cursor	(FKID)007(EOM)
F8	8	NOTHING	(FKID)008(EOM)
F9	9	NOTHING	(FKID)009(EOM)
F10	10	NOTHING	(FKID)010(EOM)
F11	11	NOTHING	(FKID)011(EOM)
F12	12	NOTHING	(FKID)012(EOM)
F13 (PF1)	13	P	(ESC) O P
F14 (PF2)	14	Q	(ESC) O Q
F15 (PF3)	15	R	(ESC) O R
F16 (PF4)	16	S	(ESC) O S
F17	17	NOTHING	(FKID)017(EOM)
F18	18	NOTHING	(FKID)018(EOM)
F19	19	NOTHING	(FKID)019(EOM)
F20	20	Init Grphx	(FKID)020(EOM)
F21	21	Enter Grphx	(FKID)021(EOM)
F22	22	Exit Grphx	(FKID)022(EOM)
F23	23	Print Grphx	(FKID)023(EOM)

### UNSHIFTED NUMERIC KEYPAD

Keypad group	91		
Enter	105	Carr. Return	(ESC) O M
Comma	106	,	(ESC) O I
Minus	108	-	(ESC) O m
Period	109	.	(ESC) O n
0	110	0	(ESC) O p
1	111	1	(ESC) O q
2	112	2	(ESC) O r
3	113	3	(ESC) O s
4	114	4	(ESC) O t
5	115	5	(ESC) O u
6	116	6	(ESC) O v
7	117	7	(ESC) O w
8	118	8	(ESC) O x
9	119	9	(ESC) O y

### UNSHIFTED CURSOR KEYPAD

			Normal Mode	Application Mode
Keypad group	92			
Up arrow	120	Cursor Up	(ESC) [ A	(ESC) O A
Down arrow	121	Cursor Down	(ESC) [ B	(ESC) O B
Right arrow	122	Cursor Right	(ESC) [ C	(ESC) O C
Left arrow	123	Cursor Left	(ESC) [ D	(ESC) O D
Home	124	Cursor Home	(ESC) [ H	(ESC) O H
Scroll down	125	Scroll Down	(ESC) [ T	(ESC) O T
Page down	126	Page Down	(ESC) [ U	(ESC) O U

### UNSHIFTED LOCAL OPERATION KEYPAD

Keypad group	93		
No scroll	127	No Scroll	(ESC) 9
Setup	128	Setup Mode	(ESC) ;
Halt	129	Halt	(ESC) a
Break	130	Break	(ESC) [ * ~

### UNSHIFTED MAIN KEYPAD

Main pad group	94		
Esc	131	(ESC)	(ESC)
Tab	132	CTRL I	CTRL I
Backspace	133	CTRL H	CTRL H
Delete	134	RUBOUT	RUBOUT
Return	135	CTRL M	CTRL M
Linefeed	136	CTRL J	CTRL J
Caps lock	137	Toggle Caps	(ESC) 6

User Defined Key Label	Key No.	Def. Execute Definitions	Def. Transmit Definitions
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### SHIFTED FUNCTION KEYS F1 to F23

F1	31	Toggle Insert	(FKID)031(EOM)
F2	32	Delete Char	(FKID)032(EOM)
F3	33	Delete Line	(FKID)033(EOM)
F4	34	Erase Window	(FKID)034(EOM)
F5	35	Send	(FKID)035(EOM)
F6	36	Auto Print Off	(FKID)036(EOM)
F7	37	Print Window	(FKID)037(EOM)
F8	38	NOTHING	(FKID)038(EOM)
F9	39	NOTHING	(FKID)039(EOM)
F10	40	NOTHING	(FKID)040(EOM)
F11	41	NOTHING	(FKID)041(EOM)
F12	42	NOTHING	(FKID)042(EOM)
F13 (PF1)	43	P	(ESC) O P
F14 (PF2)	44	Q	(ESC) O Q
F15 (PF3)	45	R	(ESC) O R
F16 (PF4)	46	S	(ESC) O S
F17	47	NOTHING	(FKID)047(EOM)
F18	48	NOTHING	(FKID)048(EOM)
F19	49	NOTHING	(FKID)049(EOM)
F20	50	Init Grphx	(FKID)050(EOM)
F21	51	Enter Grphx	(FKID)051(EOM)
F22	52	Exit Grphx	(FKID)052(EOM)
F23	53	Print Grphx	(FKID)053(EOM)

### SHIFTED NUMERIC KEYPAD

Enter	185	Carr. Return	(ESC) O M
Comma	186	,	(ESC) O l
Minus	188	-	(ESC) O m
Period	189	.	(ESC) O n
0	190	0	(ESC) O p
1	191	1	(ESC) O q
2	192	2	(ESC) O r
3	193	3	(ESC) O s
4	194	4	(ESC) O t
5	195	5	(ESC) O u
6	196	6	(ESC) O v
7	197	7	(ESC) O w
8	198	8	(ESC) O x
9	199	9	(ESC) O y

### SHIFTED CURSOR KEYPAD

			Normal Mode	Application Mode
Up arrow	200	Cursor Up	(ESC) [ A	(ESC) O A
Down arrow	201	Cursor Down	(ESC) [ B	(ESC) O B
Right arrow	202	Cursor Right	(ESC) [ C	(ESC) O C
Left arrow	203	Cursor Left	(ESC) [ D	(ESC) O D
Home	204	Cursor Home	(ESC) [ H	(ESC) O H
Scroll down	205	Scroll Up	(ESC) [ S	(ESC) O S
Page down	206	Page Up	(ESC) [ V	(ESC) O V

### SHIFTED LOCAL OPERATION

No scroll	207	No Scroll	(ESC) 9
Setup	208	Scroll Status	(ESC) [ * u
Halt	209	Reset	(ESC) c
Break	210	Long Break	(ESC) [ 1 * ~

### SHIFTED MAIN KEYPAD

Esc	211	CMD	(ESC)
Tab	212	Backtab	CTRL I
Backspace	213	CTRL H	CTRL H
Delete	214	RUBOUT	RUBOUT
Return	215	CTRL M	CTRL M
Linefeed	216	CTRL J	CTRL J
Caps lock	217	Toggle Caps	(ESC) 6

## Factory Settings of the Terminal

The factory set configuration of the terminal emulates the DEC VT102 terminal.

Factory settings occur in three main groups: Settings made in Setup Mode. Settings available by terminal commands, and Processing Mode settings. The first two groups are listed here. The Processing Mode settings are shown in another table on page 16 of this guide.

The terminal can be reset and these factory default settings selected easily by pressing the META SHIFT RESET keys or by entering Setup Mode and pressing FACTRY RESET twice.

### Setup Mode Configuration Settings

Display Width = 80 Columns  
 Pages Display Memory = 1 Page  
 Character Set = ASCII (HDS201 set as APL)  
 Video Display = Light on dark (normal)  
 Cursor Type = Fast blinking block  
 Keyclick Volume = Normal  
 Keyboard Bell = Normal  
 Scrolling = Jump

Autowrap Processing = Off  
 Cursor Pad = Send mode  
 New Line Mode = Off  
 Terminal Operating Mode = 7 bit ANSI  
 Graphics Printer = DEC LA50

#### Settings For All Communications Lines

Communications Mode = Full Duplex  
 Transmit Baud Rate = 9600  
 Receiving Baud Rate = Same as Transmit  
 Data Bits/Parity = 7/Space  
 Stop Bits = 1  
 Buffer Overflow Protocol = Send and Receive  
 CTS/RTS Protocol = Not used

Tabs are set at every 8th column as factory defaults.

### Settings of Terminal Commands

#### Message Characters:

Escape	027 (CTRL [)
Start Of Message	Not used
Function Key Ident.	028 (CTRL \)
Alt. Graphics Exit Chr.	Not used
Delay Character	Not used
End Of Field	023 (CTRL W)
End Of Line	013 (CTRL M)
End Of Message	013 (CTRL M)

Printer Buffer Pages Allocated = 0

User Defined Keys—All keys are set to Default Execute except F8—F19 and 4 arrow keys set to Default Transmit.

Refer to Keychart for definitions and settings.

Meta Key Operation = Not used

Keyboard Indicator LED L1 = Not used  
 Keyclick volume level = 3 (Normal setting in Setup)  
 Bell volume level = 3 (Normal setting in Setup)

Output Network = Keyboard to Line 1; Lines 1, 2, and 3 to Display  
 Keyboard Communication Device = Line 1

Transmit Extent = Window (1 page)  
 Transmit Delay = 0  
 Start Of Print/Transmit = (1,1) Home position  
 Limit Transmit Rate function = Not used

**Character Set Definitions:**

HDS200 = G0, G1, G2, G3 are all ASCII  
 HDS201 = G0, G2, G3 are ASCII, G1 is APL

Underline Attribute Control = Fast blink, normal position

**Attributes Selected:**

Normal Brightness	Normal Video
No Underline	Displayable
Non-blinking	No Protection

Attribute List Selected = 1

**Clear Characteristics:**

Attributes = All Default Attributes  
 Clear Character = 032 (Space)

Editing Extent = Insert/Delete in Line  
 Margin Offset Bell = Off

Top Of Screen = Line 1  
 Scrolling Region = Window, lines 1–24  
 Defined Window = 1;24;1;80  
 Window Selected = 1, for all devices  
 Defined Viewport = Lines 1–24, Window 1, drag on, viewport 1  
 Viewport Selected = 1, for all windows

Alert Line Message = blank  
 Answerback Message = blank  
 Background Status Line = blank

**Processing Mode Settings**

Refer to Processing Mode Chart in this Guide, page 16.

## HDS200 Status Lines

The HDS200 has nine Status Lines which report settings and status of various terminal functions. These are listed below. To display the Status Line, press the **STATUS** (or **SHIFT SETUP**) key. Pressing the key repeatedly scrolls through all Status Lines.

Status Lines are not the same as Setup Lines. Status Lines do not contain the same information as Setup Lines, though it is often similar. Further, Status Lines only report the setting of a mode or command, and don't offer a means of changing the setting as in Setup Mode.

The Status Lines shown below indicate factory settings of the terminal.

### General Status Line

```
ASCII ANS7 Full Host:OK Prnt:Stop Curs:001;001 Window:001;024;001;080 20/01
```

a    b    c    d    e    f    g    h

- The character set currently in use, usually ASCII or APL.
- The operating mode of the terminal, either ANSI 7- or 8-bit, or VT52.
- The basic communications mode of the terminal, either Local, Block, Half, or Full.
- The communication status of Line 1 (usually connected to the host computer). An OK means that communications is ready, Stop means communications is stopped.
- The communications status of Line 2 (usually connected to the printer), either OK or Stop.
- The current cursor position, line and column number.
- The current window definition for the main communication line as follows: beginning and ending line, beginning and ending column.
- The version number of the terminal software given in the form 20/nn.

### Communications Status Line

```
L1=9600/Tran 7/Spac 1s IO:11 L2=9600 7/Spac 1s IO:11 L3=9600 7/Spac 1s IO:11
```

a    b    c    d    e    f    a    b    d    e    f    a    b    d    e    f

This line contains status information for all three communication lines.

- The communications line for these settings.
- The transmitting baud rate for the terminal.
- The receiving baud rate for the terminal. Normally receiving and transmitting rates are the same, though different rates are available. The status of both rates is reported for Line 1 only.
- The data character size (7 or 8 bits) and the parity type used.
- The number of stop bits used.
- The status of the input (I) and output (O) on the communication line. A 1 indicates communications are ready, 0 indicates stopped communications, and a- indicates that the protocol is disabled (Buffer Overflow protocol for input lines, and both Host Receive and CTS/RTS protocols for output lines).

**Graphics Status Line**

```
Graphics: Inactive DEC LA50 ` @
```

a      b      c      d

- The current graphics operating mode of the terminal. Options include None (for non-graphics terminals), Inactive (for graphics terminals in ANSI mode), or one of the six graphics operating modes.
- The graphics printer type chosen.
- The graphics line type currently being used.
- The graphics fill type currently being used.

**Programmer Status Line** (one for each communication device)

```
K1 B-G0;B-G0 BBBB 1-0m 1-001;024;001;080w 001;024r 1t 001;001 000 000 8 1;4;5;7;8;99:0:032!r
```

a    b      c    d    e    f      g                      h    i    j    .    k    l    m      n

- First number is the Line Identifier (Keyboard, Lines 1, 2, or 3) and the second number is either the keyboard communication device (Lines 1, 2, or 3) or a duplication of the line number.
- The first position identifies the character set being used (refer to the command parameter *cset* for assignments). The next position identifies the character set (G0 to G3) which is currently mapped onto GL. After the semicolon the field lists which assignments and identifications are currently used for GR.
- These characters identify the character sets which are mapped onto G0, G1, G2, and G3. Refer to the command parameter *cset* for assignments.
- The Attribute list selected by this line, 1 to 4.
- The attributes currently in the alternate state. The "m" is the terminating character of the Select Alternate Attributes command.
- The Window number selected by this line, 1 to 4.
- The window definition given as top and bottom lines, left and right columns. The "w" is the terminating character of the Define Window command.
- The scrolling region definition as top and bottom lines. The "r" is the terminating character of the Define Scrolling Region command.
- The devices on the output network of this communication line. Refer to the command parameter *output* for assignments. The "t" is the terminating character of the Set Output Network command.
- The current cursor position given as line and column numbers.
- The delay prior to transmission in 100 millisecond units currently being used.
- The line number of the background status line.
- The maximum number of pages of memory available on the terminal, either 4 or 8.
- This field gives information on the clear characteristics currently in use. The first group shows the attributes on the clear list, the second group shows attributes on the clear list set to their alternate state, and the third group is the ASCII chart location of the clear character. The "r" are the final characters of the Set Clear Characteristics command.

**Modes Status Lines** (one for each communication line)

L1 a-101 b-00000 c-0000 d-001 e-027 f-000010 g-01101 h-11010 i-00008

a      b      c      d      e      f      g      h      i

The first field is the line identifier, either the Keyboard Line, Line 1, Line 2, or Line 3. The lettered groups show the settings of terminal commands.

- a) a-1 Buffer Overflow (Receive) Control; 0 = Off, 1 = On.  
 a-2 CTS/RTS Protocol; 0 = Off, 1 = On.  
 a-3 Host Overflow Control; 0 = Ignore XOFF, 1 = Respond to XOFF.
- b) b-1 HDS mode 105 Tab Processing; 0 = Text, 1 = Form.  
 b-2 HDS mode 104 Scrolling (Line Feed); 0 = On, 1 = Off.  
 b-3 HDS mode 108 Protected Field Overwrite; 0 = Not allowed, 1 = Allowed.  
 b-4 HDS mode 120 Character/Attribute Replacement; 0 = Both, 1 = Character only.  
 b-5 HDS mode 118 Protected Field Display; 0 = As specified, 1 = Half bright.
- c) c-1 HDS mode 206 Cursor Addressing; 0 = Window-relative, 1 = Scrolling Region-relative.  
 c-2 Numeric Pad Operation; 0 = Normal, 1 = Application.  
 c-3 HDS mode 201 Cursor Pad Operation; 0 = Normal, 1 = Application.  
 c-4 HDS mode 123 Terminal Identifier; 0 = VT102, 1 = HDS200.
- d) d-1 HDS mode 3 Transparent Mode; 0 = Execute, 1 = Display.  
 d-2 Parity Checking; 0 = Off, 1 = On.  
 d-3 HDS mode 122 Form Feed Processing; 0 = Clear Screen; 1 = Index (Line Feed).
- e) Escape Message character; number is ASCII chart location.
- f) f-1 HDS mode 207 Character Wraparound; 0 = Off, 1 = On.  
 f-2 HDS mode 107 Cursor Wraparound; 0 = Off, 1 = On.  
 f-3 HDS mode 20 Line Feed Processing; 0 = Line Feed, 1 = New Line (CR/LF).  
 f-4 HDS mode 106 Auto Tabs; 0 = Off, 1 = On.  
 f-5 HDS mode 112 Keyboard Bell; 0 = Off, 1 = On.  
 f-6 HDS mode 4 Replace/Insert Characters; 0 = Replace, 1 = Insert.
- g) g-1 HDS mode 101 ASCII/APL; 0 = Off, 1 = On.  
 g-2 HDS mode 121 ASCII Underline on Input; 0 = Attribute, 1 = Character.  
 g-3 Editing Extent; 00 = Window, 01 = Field/Window, 10 = Line, 11 = Field/Line.  
 g-4 HDS mode 6 Erase Protected Characters; 0 = No, 1 = Yes.
- h) h-1 HDS mode 1 Transmit Unprotected/All; 0 = Unprotected Only, 1 = All.  
 h-2 HDS mode 114 Trailing Spaces On Output; 0 = Transmit, 1 = Suppress.  
 h-3 HDS mode 115 Underline Transmission; 0 = Transmit, 1 = Suppress.  
 h-4 HDS mode 117 Print Termination Character; 0 = None, 1 = Form Feed.  
 h-5 Transmit Extent; 0 = Window, 1 = Line, 3 = Field.
- i) i-1 HDS mode 16 Transmit Termination; 0 = End Of Field/Line/Window, 1 = Cursor Position  
 i-2 HDS mode 116 Transmit Initiation; 0 = Window, 1 = Start Of Print/Transmit.  
 i-3 HDS mode 103 Display Width; 0 = 80 columns, 1 = 132.  
 i-4 HDS mode 113 Alert Line Display; 0 = Automatic, 1 = On Request.  
 i-5 Display Memory; Number is pages allocated to display memory (total pages on terminal = display pages + printer buffer pages).

**Tabs Status Line**

.2345678.0123456.8901234.6789012.4567890.2345678.0123456.8901234.6789012.4567890.2345678.0123456.

Factory Settings have tabs set at every eighth column.

**Message Character Status Line**

255	028	255	000	023	255	013	255	013	255
a	b	c	d	e	f	g	h	i	j

Refer to the Set Message Character command for a table of message characters. Numbers are ASCII chart locations of the character used; 255 indicates that the character is not used.

- Start Of Message character.
- Function Key Identifier.
- Graphics Exit character.
- Delay character.
- End Of Line, first character.
- End Of Line, second character.
- End Of Field, first character.
- End Of Field, second character.
- End Of Message, first character.
- End Of Message, second character.

**Alert Message Status Line**

LOCK	error	K:000	001	Blk,071	Char	Alert Line Message
a	b	c	d	e		

- Keyboard Lock message.
- Error number response to Self Test commands.
- Key number of key in response to Display User Defined Key command.
- Programmable memory currently available for User Defined Keys. The number of characters is given as Blk (blocks = 256 characters) and Char (number of characters) remaining.
- Text of the Alert Line Message, up to 40 characters.

**Viewport Status Line**

1-001;024 (1)2	2-	3-	4-
a	b	c	d

- Viewport number
- Viewport definition, beginning and ending lines.
- Window assignment of viewport.
- Viewport operation, 0 = drag on; 1 = drag off; 2 = default.

**Character Set Diagrams**

There are four standard character sets available for use with the HDS200 Series terminals. Graphics terminals, when in Graphics--Alpha mode, use the ASCII character set with some variations of the dot patterns, depending on the sizes of the characters being generated.

HDS201 (APL) terminals have different character sets. Refer to the APL section of this manual for those character set diagrams.

**ASCII character set**

000	001	002	003	004	005	006	007	008	009	010	011	012	013	014	015
N	S	E	E	E	A	B	B	M	L	V	F	C	S	S	S
L	H	X	X	T	Q	K	L	S	T	F	T	F	R	O	I
016	017	018	019	020	021	022	023	024	025	026	027	028	029	030	031
D	D	D	D	D	N	S	E	C	E	S	E	F	R	U	S
E	1	2	3	4	K	N	E	N	M	B	C	S	S	S	S
032	033	034	035	036	037	038	039	040	041	042	043	044	045	046	047
!	"	#	\$	%	&	'	(	)	*	+	,	-	.	/	
048	049	050	051	052	053	054	055	056	057	058	059	060	061	062	063
0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
064	065	066	067	068	069	070	071	072	073	074	075	076	077	078	079
@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
080	081	082	083	084	085	086	087	088	089	090	091	092	093	094	095
P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
096	097	098	099	100	101	102	103	104	105	106	107	108	109	110	111
`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127
p	q	r	s	t	u	v	w	x	y	z	{		}	~	⊠

**VT100 and Special Graphics character set**

000	001	002	003	004	005	006	007	008	009	010	011	012	013	014	015
016	017	018	019	020	021	022	023	024	025	026	027	028	029	030	031
032	033	034	035	036	037	038	039	040	041	042	043	044	045	046	047
!	"	#	\$	%	&	'	(	)	*	+	,	-	.	/	
048	049	050	051	052	053	054	055	056	057	058	059	060	061	062	063
0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
064	065	066	067	068	069	070	071	072	073	074	075	076	077	078	079
@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
080	081	082	083	084	085	086	087	088	089	090	091	092	093	094	095
P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
096	097	098	099	100	101	102	103	104	105	106	107	108	109	110	111
⊠	⊠	H	F	C	L	°	+	N	V	I	T	T	T	T	T
112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127
—	—	—	—	H	T	T	T	T	T	T	T	T	T	T	⊠

**Nroff/Scientific character set**

000	001	002	003	004	005	006	007	008	009	010	011	012	013	014	015
	□	φ	>		≠	→	↳	↳	↳	↳	↳	↳	↳	↳	↳
016	017	018	018	020	021	022	023	024	025	026	027	028	029	030	031
	l	l	l	l	l	l	l	l	l	l	l	l	l	l	l
032	033	034	035	036	037	038	039	040	041	042	043	044	045	046	047
	∇	π	#	{	}	±	∇	÷	∇	∇	∇	∇	∇	∇	∇
048	049	050	051	052	053	054	055	056	057	058	059	060	061	062	063
	0	1	2	3	4	5	6	7	8	9	^	π	∇	+	∇
064	065	066	067	068	069	070	071	072	073	074	075	076	077	078	079
	l	∇	∞	Ψ	Φ	+	<	∇	∇	∇	>	∇	∇	∇	∇
080	081	082	083	084	085	086	087	088	089	090	091	092	093	094	095
	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇
096	097	098	099	100	101	102	103	104	105	106	107	108	109	110	111
	∇	α	β	ψ	φ	ε	λ	η	ι	κ	ω	μ	γ	ο	
112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127
	ρ	γ	θ	σ	τ	ε	χ	δ	χ	υ	ζ	ε	κ	μ	∇

**International character set**

000	001	002	003	004	005	006	007	008	009	010	011	012	013	014	015
8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
016	017	018	019	020	021	022	023	024	025	026	027	028	029	030	031
9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
032	033	034	035	036	037	038	039	040	041	042	043	044	045	046	047
	l	φ	∇		∇		∇	∇	∇	∇	∇	∇	∇	∇	∇
048	049	050	051	052	053	054	055	056	057	058	059	060	061	062	063
	∇	±	2	3		μ	∇	+		l	∇	>	∇	∇	∇
064	065	066	067	068	069	070	071	072	073	074	075	076	077	078	079
	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇
080	081	082	083	084	085	086	087	088	089	090	091	092	093	094	095
	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇
096	097	098	099	100	101	102	103	104	105	106	107	108	109	110	111
	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇
112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127
	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇

## HDS200G Graphics Command Summary

The graphics terminal commands listed below are either control codes or command sequences. Control codes are generated from the keyboard by holding down the control key *CTRL* while pressing another key. Command sequences are generated from the keyboard by striking the key labeled *CMD* (*SHIFT ESC*) and then typing the remainder of the sequence.

Command sequences are shown with the following conventions:

- ESC stands for the ESCAPE control code (ESC, ASCII 027). Commands from the keyboard use the *CMD* key (*SHIFT ESC*). Sp indicates a Space character (ASCII 032); RUB indicates the rubout control code (ASCII 127); and CTRL indicates a control code (ASCII 0-31). F20, F21, F22, F23 indicate function keys with those labels.

- All characters are literals, upper or lower case, and should be entered as the ASCII codes indicate.

- Command sequences may contain no embedded spaces; blank space in command listings is only for clarity of presentation.

- A parameter, usually shown as an abbreviation in lower case italic letters, in a command sequence indicates a user selected value for some particular command operation.

- If a special key generates the control code or command sequence, the key label appears in underlined italics following the command name as an alternate listing.

- The parameter default value is the value (usually 0 or 1) used if no parameter is specified. This is often the same as the factory setting, but sometimes different, so don't confuse the two values. For instance, the Rotate Rectangle command has a parameter default of 0 (rotation = 270 degrees) but the factory setting for the command is 2 (rotation = 0 degrees).

## Graphics Mode Addressing

Individual address locations are known as "tekpoints". Tektronix addressing conventions use the 1024 x 1024 coordinate format but display only addresses 780 x 1024. The HDS200G automatically scales addresses from a 780 x 1024 tekpoint format onto the actual number of screen pixels present (350 x 720). A special mode is provided to eliminate this scaling if desired, thus allowing addressing of actual screen pixels.

Graphics addresses on the 1024 x 1024 grid are converted to four letter sequences of ASCII characters by formulas given below. These addresses are used in a number of vector, GIN, and point plot mode commands following. Note that Vector and Point Plot point addresses use different conversion formulas than GIN mode addresses. These are summarized below. Refer to the *HDS200 Programmer's Reference Manual* for details and sample calculations.

### Vector and Point Plot Addresses

HI-Y = ASCII [32 + INT(Y/32)]

LO-Y = ASCII [96 + MOD(Y,32)]

HI-X = ASCII [32 + INT(X/32)]

LO-X = ASCII [64 + MOD(X,32)]

### GIN Mode Addresses

GIN HI-X = ASCII [32 + INT (X/32)]

GIN LO-X = ASCII [32 + MOD (X,32)]

GIN HI-Y = ASCII [32 + INT (Y/32)]

GIN LO-Y = ASCII [32 + MOD (Y,32)]

Graphics addresses on the 4096 x 4096 grid are converted to five letter sequences of ASCII characters, called HI-Y, EXTRA, LO-Y, HI-X, LO-X. The values of these characters are calculated from the x,y coordinates as follows:

HI-Y = ASCII [32 + INT(Y/128)]

EXTRA = ASCII [(ex Y) + (ex X) + 96] where

ex Y = {MOD [ MOD (Y,128),4]} x 4

ex X = MOD [ MOD (X,128),4]

LO-Y = ASCII [96 + INT [MOD (Y,128)/4]]

HI-X = ASCII [32 + INT(X/128)]

LO-X = ASCII [64 + INT [MOD (X,128)/4]]

## GENERAL GRAPHICS MODE COMMANDS

Command Name	** Notes	Command Sequence
Enter Vector Mode		CTRL ]
Enter Point Plot Mode		CTRL \
Enter Incremental Point Plot Mode		CTRL ^ <i>pen</i>
Enter Graphics (Keyboard only)		
Alpha Mode <i>also F20</i>	(1),(2)	--
(Alternate) <i>also F21</i>	(2)	--
Exit Graphics <i>also F22</i>		CTRL X
(Alternate)		ESC " 0 g
Define Alternate Graphics Exit Character		ESC [ 3; <i>chr</i> ! t
Bell		CTRL G
Delay Character		CTRL @
(Alternate)		CTRL V
(Alternate)		ESC CTRL V
Transmit Status	(3),(4)	ESC CTRL E
Blank Screen	(5)	ESC [ <i>blank</i> +
Enter Graphics <i>also F21</i>		ESC [ <i>gmode</i> + z
Select Graphics Printer		ESC [ <i>printer</i> + ~

*blank*    **0 = display interactive display memory**  
           1 = do not display interactive display memory  
           2 = display graphics memory  
           3 = do not display graphics memory.

*chr*        ASCII chart location of character (000–127), Default = 000. If the *chr* parameter is omitted, the exit character is not used.

*gmode*    **0 = enter graphics, alpha mode**  
           1 = enter graphics, alpha mode and clear memory  
           2 = enter graphics, vector mode  
           3 = enter graphics, point plot mode  
           4 = enter graphics, incremental point plot mode.

*pen*        Pen up command = Space (ASCII 032); pen down = P (ASCII 080).

*printer*   **0 = DEC LA50**  
           1 = Epson FX80  
           2 = C. Itoh Prowriter  
           3 = Anadex 9620  
           4 = Okidata Microline 92  
           5 = HP Thinkjet

## \*\* Notes:

(1) This command clears graphics memory, sets the data level to white, disables block fill, and sets the line type to normal.

(2) This command homes the alpha cursor (upper left corner) and the vector cursor (lower left corner).

(3) The characters transmitted are a one-character terminal status indicator, the four-character GIN address, followed by a programmable status terminating character (default is CR, ASCII 013). Terminal status characters are not transmitted in GIN mode. The terminal status indicators are:

% (ASCII 037) indicates Margin 0, Alpha Mode  
 ! (ASCII 033) indicates Margin 0, Vector Mode  
 ' (ASCII 039) indicates Margin 1, Alpha Mode  
 # (ASCII 035) indicates Margin 1, Vector Mode

(4) After transmitting the terminal status, data is ignored until one of the following control codes is received: CTRL G, CTRL J, CTRL M, CTRL O, CTRL ], CTRL \_, ESC CTRL E, ESC CTRL L, ESC CTRL W, ESC CTRL Z, F20, F21, F22. This character is also processed.

(5) Refer also to HDS mode 125.

**DISPLAY MEMORY COMMANDS**

Command Name	** Notes	Command Sequence
Screen Video—Fill Screen		ESC X
Screen Video—Complement Screen		ESC Y
Blank Screen		ESC [ <i>blank</i> +
Blank Inactive Display Memory		ESC [ = 125 h
Don't Blank Inactive Display Memory		ESC [ = 125 l
Memory Dump		ESC # <i>loc</i>
Memory Load		ESC \$ <i>loc data</i>
Print Graphics Memory <i>also F23</i>		ESC CTRL W
Clear Graphics Memory		CTRL Y
(Alternate)		ESC CTRL Y
Graphics Memory—Nondisplay		ESC CTRL R
Graphics Memory—Display		ESC CTRL T

*blank* specifies the display of the interactive and the graphics display memories.

**0 = display interactive memory contents**

- 1 = don't display interactive memory contents
- 2 = display graphics memory contents
- 3 = don't display graphics memory contents

*data* a sequence that specifies the data level, either white or black corresponding to pixel ON or OFF respectively, for each of the 360 pixels (45 bytes) in the graphics memory section specified by the *loc* parameter. The sequence is preceded by an = (ASCII 061) and followed by a ; (ASCII 059) and a CR (ASCII 013). The 360 pixel sequence is divided into groups of 8 pixels (corresponding to a transmitted byte) and each group of 8 is represented as two hexadecimal numbers (1 means pixel white, 0 means pixel black). A sequence of N bytes containing all white pixels (or black pixels) is transmitted as \$ (or #) followed by the ASCII character whose chart location is 64 plus N.

*loc* a two-character designation for a half-line section of the graphics screen. Graphics display is divided into 700 sections (350 rows by 2 columns) numbered 0 to 699 in row order starting in the upper left corner of the display (even numbers on left side of display, odd numbers on right side of display).

The two characters to enter are:

ASCII [32 + INT (LOC/32)]

ASCII [32 + MOD (LOC,32)]

**MODE CHANGING COMMANDS**

Command Name	** Notes	Command Sequence
Alpha Mode; CR <i>also RETURN</i>		CTRL M
Alpha Mode; No Movement		CTRL _
Alpha Mode; Clear Memory <i>also F20</i>	(1)	ESC CTRL L
Alpha Mode; Home Cursors <i>also F21</i>	(2)	--
Vector Mode		CTRL ]
GIN Mode	(3)	ESC CTRL Z
(Alternate)		ESC " 4 g
Point Plot Mode		CTRL \
Incremental Point Plot Mode		CTRL ^
Special Point Plot Mode		ESC CTRL \

\*\* Notes:

- (1) This command clears graphics memory, sets the data level to white, disables block fill, and sets the line type to normal.
- (2) This command homes the alpha cursor (upper left corner), and the vector cursor (lower left corner).
- (3) Use the keyboard arrow keys if the joystick option is not installed. Shifted arrow keys move multiple lines or columns with each keystroke.

**ALPHA MODE COMMANDS**

Command Name	** Notes	Command Sequence
ASCII Character Set		ESC CTRL O
APL Character Set		ESC CTRL N
Cursor Up	(1)	CTRL K
Cursor Down <i>also</i> <u>LINE FEED</u>	(1)	CTRL J
Cursor Left <i>also</i> <u>BACK SPACE</u>	(1)	CTRL H
Cursor Right <i>also</i> <u>TAB</u>	(1)	CTRL I
(Alternate) <i>also</i> <u>SPACE</u>	(1)	Sp
Carriage Return <i>also</i> <u>RETURN</u>		CTRL M
Non-destructive Space (Default)		ESC / 2 l
Destructive Space Processing		ESC / 2 h
Non-destructive Backspace (Default)		ESC / 9 l
Destructive Backspace Processing		ESC / 9 h
Carriage Return—Line Feed Processing		ESC / <i>newline</i> s
Character Set Sizes		
Normal (Default) 35 rows x 80 columns		ESC 8
(Alternate)		ESC 0
Small—38 rows x 90 columns		ESC 9
Smaller—50 rows x 102 columns		ESC :
Smallest—58 rows x 120 columns		ESC ;
2x (two times)—17 rows x 36 cols		ESC 1
3x (three times)—11 rows x 24 cols		ESC 2
4x (four times)—8 rows x 18 cols		ESC 3
Rotation of Characters		ESC / <i>rot</i> e
Slanted Characters		ESC <
Do Not Slant Characters (Default)		ESC =
<i>newline</i>	<b>0 = Normal CR and LF</b> 1 = Auto CR (CR = CR/LF)	2 = Auto LF (LF = CR/LF) 3 = Auto CR/LF (CR and LF = CR/LF)
<i>rot</i>	<b>0 = rotate 270 degrees</b> 2 = rotate 0 degrees	4 = rotate 90 degrees 6 = rotate 180 degrees

**\*\* Notes:**

(1) Keyboard arrow keys function in GIN Mode and ANSI mode only.

**POINT/VECTOR ADDRESS COMMANDS**

Command Name	** Notes	Command Sequence
Draw Vector or Block		<i>address</i>
Reposition Point Plot Cursor		CTRL \ <i>address</i>
Plot a point		<i>address</i>
Reposition Special Point Plot Cursor		ESC CTRL \ <i>intens address</i>
Plot a Point (Special Point Plot Mode)		<i>intens address</i>
Transmit GIN Crosshair Address		<i>char</i>

*address* a four character sequence giving the cursor position as follows: HI-Y, LO-Y, HI-X, LO-X. Refer to the Graphics Addressing section at the beginning of the Graphics Command Summary.

*char* In GIN mode any character entered from the keyboard will cause that character to be transmitted to the host computer followed by the four-character crosshair address and terminated with the selected terminator(s) (default CTRL M, ASCII 013). The four-character crosshair address is: GIN HI-X, GIN LO-X, GIN HI-Y, GIN LO-Y. Refer to the Graphics Addressing section at the beginning of the Graphics Command Summary.

*intens* specifies the intensity of the tekpoint at the address location in Special Point Plot Mode. *intens* is entered as an ASCII character, values 032 through 125. Since the monitor hardware cannot display variable intensities, this command is accepted but treated as a Point Plot Mode command.

**VECTOR MODE COMMANDS**

Command Name	** Notes	Command Sequence
Draw Vector or Block	(1)	<i>address</i>
Reposition Vector Cursor		CTRL ]
Normal address scaling (Default)		ESC / 1 l
Non-scaled addressing		ESC / 1 h
Draw Rectangle		ESC / <i>xhom;yhom;dx;dy</i> x
Draw & Fill Rectangle		ESC / <i>xhom;yhom;dx;dy;fill</i> y
Rotation of Rectangles		ESC / <i>rot</i> e
Fill Patterns		
Solid (Default)		ESC @
Gray		ESC A
Left to Right Slant		ESC B
Right to Left Slant		ESC C
Horizontal Lines		ESC D
Vertical Lines		ESC E
Slanted cross-hatch		ESC F
Vertical cross-hatch		ESC G
Checkerboard		ESC H
Dotted		ESC I
Horizontal herringbone		ESC J
Vertical herringbone		ESC K
Vector Draw Mode (Default)		ESC CTRL C
Block Fill Mode		ESC CTRL B
Data Level		ESC / <i>data</i> d
Vector Line Type		
Normal (Default)	(2)	ESC ^
Dotted	(3)	ESC a
Dot-Dashed	(4)	ESC b
Short-Dashed	(5)	ESC c
Long-Dashed	(6)	ESC d
User-Defined-1		ESC x
User-Defined-2		ESC y
User-Defined-3		ESC z
Define Line Types		
Define User 1		ESC / <i>ptrn</i> a
Define User 2		ESC / <i>ptrn</i> b
Define User 3		ESC / <i>ptrn</i> c
Arc/Circle Draw		ESC / <i>x;y;R;T;P</i> A
Arc/Circle Draw and Fill		ESC / <i>x;y;R;T;P;fill</i> B

*address* the four ASCII character address giving the x,y coordinates as follows: HI-Y, LO-Y, HI-X, LO-X. Refer to the Graphics Addressing section at the beginning of the Graphics Command Summary.

*data* **0 = White (draw) data level.** Alternate command is ESC CTRL A.  
**1 = Black (erase) data level.** Alternate command is ESC CTRL P.  
**2 = Complement data level.** Alternate command is ESC CTRL U.  
**3 = Replace data level.**

*dx, dy* specify the width and height, respectively, of the rectangle in tek-points, expressed as a number 1 to 1023.

- fill*      **0 = current fill pattern used**  
 1 = Solid  
 2 = Gray  
 3 = Left to Right Slant  
 4 = Right to Left Slant  
 5 = Horizontal Lines  
 6 = Vertical Lines  
 7 = Slanted Cross-hatch  
 8 = Vertical Cross-hatch  
 9 = Checkerboard  
 10 = Dotted  
 11 = Horizontal Herringbone  
 12 = Vertical Herringbone  
 13, 14, 15 = Border without Fill
- P*      length of the arc drawn in degrees, 0 or 360 is a full circle. Default = 0.
- ptrn*      a decimal number between 1 and 65,535 which, when expressed in binary form, supplies the pattern for the definition of the line. For example, *ptrn* = 28239 defines the line pattern:  
 0110 1110 0100 1111
- R*      radius of the arc or circle in tekpoints
- rot*      **0 = rotate 270 degrees**  
 2 = rotate 0 degrees (Factory Setting)  
 4 = rotate 90 degrees  
 6 = rotate 180 degrees
- T*      starting point of the arc in degrees, 0 is due East on the display screen. Default = 0.
- x,y*      coordinates of the center of the circle or arc
- xhom, yhom*      specify the x and y coordinates of the lower left corner of the rectangle, expressed as a number 1 to 1023.

**\*\* Notes:**

- (1) This command positions the vector cursor and draws a vector or fills a block from the previous cursor position. If this is the first time an address is received after CTRL ] (command to enter Vector mode), the vector cursor assumes that address location, but nothing is drawn or filled.
- (2) Alternates for ` (ASCII 96) are e (101), f (102), g (103), h (104), m (109), n (110), o (111), p (112), u (117), v (118), and w (119).
- (3) Alternates for a (ASCII 97) are i (105) and q (113).
- (4) Alternates for b (ASCII 98) are j (106) and r (114).
- (5) Alternates for c (ASCII 99) are k (107) and s (115).
- (6) Alternates for d (ASCII 100) are l (108) and t (116).

**INCREMENTAL POINT PLOT MODE COMMANDS**

Command Name	** Notes	Command Sequence
Enter Incremental Point Plot Mode		CTRL ^ <i>pen</i>
Pen Up		Sp
Pen Down		P
Move East		A
Move West		B
Move North		D
Move Northeast		E
Move Northwest		F
Move South		H
Move Southeast		I
Move Southwest		J

*pen*      Pen up = Space (ASCII 032) and pen down = P (ASCII 080).

**GIN MODE (Graphical Input Mode) COMMANDS**

Command Name	** Notes	Command Sequence
Enter GIN Mode		ESC CTRL Z
(Alternate)		ESC " 4 g
Crosshair Cursor Up <i>also up arrow</i>	(1)	--
Crosshair Cursor Down <i>also down arrow</i>	(1)	--
Crosshair Cursor Left <i>also left arrow</i>	(1)	--
Crosshair Cursor Right <i>also right arrow</i>	(1)	--
Transmit Crosshair Address	(2)	<i>char</i>
Transmit Status	(2),(3)	ESC CTRL E
Enter Alpha Mode; Clear Memory		ESC CTRL L
Exit GIN Mode		<u>F20, F21, F22</u>
Load Crosshair Position		ESC / f
Crosshair Address/Status Terminator		ESC / term t

*char* Transmitted sequence is a keyboard character, a four character crosshair address, and the selected terminator character. The address characters are: GIN HI-X, GIN LO-X, GIN HI-Y, GIN LO-Y. Refer to the Graphics Addressing section at the beginning of the Graphics Command Summary.

*term* **0 = terminating character is CR (ASCII 013).**  
 1 = no terminating character  
 2 = terminating characters are CR, EOT (ASCII 013,004)  
 3 = terminating characters are CR, LF (ASCII 013,010)

**\*\* Notes:**

(1) Keyboard arrow keys should be used when the joystick option is not installed. Shifted arrow keys move multiple lines or columns with a single keystroke.

(2) After transmitting the status, all data is ignored until one of the following characters is received: CTRL G, CTRL J, CTRL M, CTRL O, CTRL ], CTRL \_, ESC CTRL E, ESC CTRL L, ESC CTRL W, ESC CTRL Z, F20, F21, F22. This character is also processed.

(3) The characters transmitted are the one-character terminal status, the four-character GIN status (the *char* parameter), followed by the programmable status terminator (default value is CR, ASCII 013). The terminal status character is not transmitted in GIN mode. The terminal status character is as follows:

- % (ASCII 037) designates Margin 0, Alpha Mode
- ! (ASCII 033) designates Margin 0, Vector Mode
- ' (ASCII 039) designates Margin 1, Alpha Mode
- # (ASCII 035) designates Margin 1, Vector Mode

**Factory Settings In Graphics Mode**

- Graphics printer = DEC LA50
- Display memory control = Do not display inactive memory
- GIN Mode Terminating Character = CR
- Alternate Graphics Exit Character = Not Used

**Alpha Mode Settings**

- ASCII Character Set (APL Character Set for HDS201G)
- Non-destructive Space Processing
- Non-destructive Backspace Processing
- Normal CR and LF Processing
- Normal Character Size (35 lines x 80 columns)
- No Character Rotation
- No Character Slant

**Vector Mode Settings**

- Normal Address Scaling (780 x 1024 onto 350 x 720)
- Fill Pattern = Solid
- Vector Draw
- Data Level = White
- Line Type = Solid
- No Rectangle Rotation

## APL Terminal Operation

HDS201 and HDS201G terminals are configured for APL operation, including factory settings which select the APL character set, APL Overstrike Mode (HDS mode 101), and Automatic APL Overstrike Storage (HDS mode 126). The G0 character set is defined as the ASCII set and the G1 set is defined as the APL set. The RAM character set is automatically defined and partially loaded with a list of factory defined APL overstrike characters.

### APL Operating Commands

Command Name	** Notes	Command Sequence
Define G0 Character Set		ESC ( <i>cset</i>
Define G1 Character Set		ESC ) <i>cset</i>
Lock Shift G0 into GL		CTRL O
Lock Shift G1 into GL		CTRL N
Define APL Overstrikes		ESC [ <i>apl;achr;bchr</i> + <i>p</i>
ASCII Set; Overstrike Off		ESC [ = 101 I
APL Set; Overstrike On		ESC [ = 101 H
Automatic Overstrike Storage Off		ESC [ = 126 I
Automatic Overstrike Storage On		ESC [ = 126 H

#### *apl*    **0 = add overstrike pairs**

- 1 = return to factory settings
- 2 = display user defined pairs

*achr*    APL chart location for first character of user defined overstrike pair. 0 = illegal.

*bchr*    APL chart location for second character of user defined overstrike pair. 0 = illegal.

*cset*    B = ASCII character set  
 0 = VT100 and Special Graphics character set  
 2 = APL character set  
 3 = RAM (user-definable) character set  
 < = International character set

Note that *cset* cannot be omitted but must have a character entered.  
 All other values of *cset* select B (ASCII).

Some terminal commands operate differently on HDS201 terminals. On APL terminals the **CTRL O** and **CTRL N** (Lock Shift G0 into GL and Lock Shift G1 into GL, respectively) commands are coupled with the setting of HDS mode 101. If G1 is defined as the APL character set, the **CTRL N** command which shifts G1 into GL also changes HDS mode 101 to the Set State (Overstrike On) and the **CTRL O** command which shifts G0 into GL also changes HDS mode 101 to the Reset State (Overstrike Off).

The Transmit Status Line and the Copy Window commands are not available on the HDS201 terminal. Also, only the General and Alert Message Status Lines are present.

Refer to Appendix D of the *HDS200 User's Manual* and the *HDS200 Programmer's Reference Manual* for additional information about APL terminal operation.

### The APL And ASCII Character Sets

These character sets are particularly important when you're using terminal commands because they allow you to convert the letters used in a command to ASCII chart locations. You can then use the same chart locations in the APL character set to determine the corresponding characters you must use on the APL keyboard to generate the same ASCII codes. Remember that a command is interpreted as a sequence of chart locations, not the letters (in whichever character set) which may represent them. Refer to the latter part of Chapter 2 of the *HDS200 User's Manual* for a more complete discussion of this concept.

The HDS201 terminals have the following character sets available: the ASCII character set, the APL character set, the VT100 and Special Graphics character set, and the Nroff/Scientific character set. Diagrams for the ASCII and APL sets are shown below. Diagrams for the other sets are shown elsewhere in this Guide.

**APL Character Set**

000	001	002	003	004	005	006	007	008	009	010	011	012	013	014	015
0	1	2	3	4	5	6	7	8	9	i	j	k	n	=	,
016	017	018	019	020	021	022	023	024	025	026	027	028	029	030	031
0	1	2	3	4	5	6	7	8	9	i	j	k	n	=	,
032	033	034	035	036	037	038	039	040	041	042	043	044	045	046	047
		)	<	<	=	>	∫	∨	∧	≠	÷	,	+	.	/
048	049	050	051	052	053	054	055	056	057	058	059	060	061	062	063
0	1	2	3	4	5	6	7	8	9	(	[	;	x	:	\
064	065	066	067	068	069	070	071	072	073	074	075	076	077	078	079
	α	∓	n	∫	∫	∇	Δ	∫	∫	∫	∫	∫	∫	∫	∫
080	081	082	083	084	085	086	087	088	089	090	091	092	093	094	095
*	?	p	∫	∫	∫	∫	∫	∫	∫	∫	∫	∫	∫	∫	∫
096	097	098	099	100	101	102	103	104	105	106	107	108	109	110	111
◇	A	B	C	D	E	F	G	H	I	J	K	L	M	N	Ö
112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127
P	Q	R	S	T	U	V	W	X	Y	Z	{		}	\$	ℓ

**ASCII Character Set**

000	001	002	003	004	005	006	007	008	009	010	011	012	013	014	015
N	E	E	E	E	E	E	E	E	E	L	V	F	E	E	E
L	H	X	X	T	Q	K	L	S	T	F	T	F	R	O	I
016	017	018	019	020	021	022	023	024	025	026	027	028	029	030	031
D	D	D	D	D	N	S	E	C	E	S	E	F	G	R	U
E	1	2	3	4	K	N	E	N	M	B	C	S	S	S	S
032	033	034	035	036	037	038	039	040	041	042	043	044	045	046	047
!	"	#	\$	%	&	'	(	)	*	+	,	-	.	/	
048	049	050	051	052	053	054	055	056	057	058	059	060	061	062	063
0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
064	065	066	067	068	069	070	071	072	073	074	075	076	077	078	079
@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
080	081	082	083	084	085	086	087	088	089	090	091	092	093	094	095
P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
096	097	098	099	100	101	102	103	104	105	106	107	108	109	110	111
`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127
p	q	r	s	t	u	v	w	x	y	z	{		}	~	⊞

## VT52 Mode Operation

The HDS200 terminal emulates a DEC VT52 terminal when VT52 mode is selected in Setup Mode or when HDS mode 202 is in the Reset State. This mode of operation does not use ANSI standards for command structure and most of the common terminal commands are inoperative when the terminal is in VT52 mode. Other factory settings, such as some User Defined Key assignments, are also different. The following lists give the commands and assignments that function in VT52 mode.

### VT52 Mode Commands

---

Return to ANSI Mode	ESC <
Identify Terminal Type (Response: ESC / Z)	ESC Z
Numeric Pad Normal Mode	ESC >
Numeric Pad Application Mode	ESC =
Select ASCII Character Set	ESC G
Select Special Graphics Character Set	ESC F
Erase to End of Window	ESC J
Erase to End of Line	ESC K
Reverse Line Feed	ESC I
Auto Print On	ESC ^
Auto Print Off	ESC _
Printer Controller On	ESC W
Printer Controller Off	ESC X
Print Screen	ESC ]
Print Cursor Line	ESC V
Cursor Up	ESC A
Cursor Down	ESC B
Cursor Right	ESC C
Cursor Left	ESC D
Cursor Home	ESC H
Direct Cursor Address (l = Line; c = Column)	ESC Y l c

Cursor addressing is limited to lines 1–24 and columns 1–80. For *Line* and *Column* enter the character whose ASCII chart location corresponds to the desired line or column number as follows:

**Numbers:**

1 to 80

**Chart Locations:**

ASCII 032 to 111 ( Sp to o )

### VT52 User Defined Key Functions

User Defined Keys have different factory assigned definitions when the terminal operates in VT52 mode. These assignments are shown below. User assigned definitions, except those which use ANSI commands or other commands prohibited in VT52 mode operation, will function normally.

Key Name	Default Execute Assignment	Default Transmit Assignment
Home Cursor	ESC H	
Left Cursor	ESC D	
Right Cursor	ESC C	
Up Cursor	ESC A	
Down Cursor	ESC B	
SCROLL (Down)	ESC T	
SHIFT SCROLL (Up)	ESC S	
PAGE (Down)	ESC U	
SHIFT PAGE (Up)	ESC V	
ESC	ESC	
SHIFT ESC (CMD)	CMD	
SETUP	ESC ;	
SHIFT HALT (RESET)	ESC c	
BREAK	ESC * ~	
PRINT	ESC ? 5 i	
SHIFT PRINT	ESC ? 4 i	
PRINT SCRN	ESC = i	
SHIFT PRINT SCRN	ESC = 9 i	

---

**VT52 Numeric Keypad**

(shifted and unshifted)	(numeric mode operation)	(application mode operation)
F13 (PF1)	ESC P	ESC P
F14 (PF2)	ESC Q	ESC Q
F15 (PF3)	ESC R	ESC R
F16 (PF4)	ESC S	ESC S
ENTER	CR	ESC ? M
, (comma)	,	ESC ? I
TAB	TAB	ESC ? N
- (minus)	-	ESC ? m
. (period)	.	ESC ? n
0	0	ESC ? p
1	1	ESC ? q
2	2	ESC ? r
3	3	ESC ? s
4	4	ESC ? t
5	5	ESC ? u
6	6	ESC ? v
7	7	ESC ? w
8	8	ESC ? x
9	9	ESC ? y

**Communications Line Pin Assignments**

LINE	PIN NUMBER	DESCRIPTION	DIRECTION FROM TERMINAL
1 (male)	1	Protective Ground	- -
	2	Transmitted Data	Data out
	3	Received Data	Data in
	4	Request to Send (RTS)	Signal out
	5	Clear to Send (CTS)	Signal in
	7	Signal Ground	- -
2 (female)	20	Data Terminal Ready (DTR)	Signal out
	1	Protective Ground	- -
	2	Received Data	Data in
	3	Transmitted Data	Data out
	4	Clear to Send (CTS)	Signal in
	5	Request to Send (RTS)	Signal out
	6	Data Set Ready (DSR)	Signal out
7	Signal Ground	- -	
3 (male)	8	Carrier Detect (CD)	Signal out
	1	Protective Ground	- -
	2	Transmitted Data	Data out
	3	Received Data	Data in
	4	Request to Send (RTS)	Signal out
5	Clear to Send (CTS)	Signal in	
7	Signal Ground	- -	
20	Data Terminal Ready (DTR)	Signal out	

**Protective Ground**—This pin is a ground for the cable.

**Transmitted Data**—This pin transmits data from the terminal to the device.

**Received Data**—This pin receives data from the device to the terminal.

**Request to Send**—The RTS signal is set ON by the terminal when it is ready to transmit data.

**Clear to Send**—The CTS signal is sent by the other device as permission to send data from the terminal.

**Signal Ground**—This ground is used to establish a reference value for the data lines.

**Data Terminal Ready**—The terminal generates this signal to indicate that the terminal is turned ON.

**Data Set Ready and Carrier Detect**—These signals are internally connected together and indicate that the terminal is turned ON.



