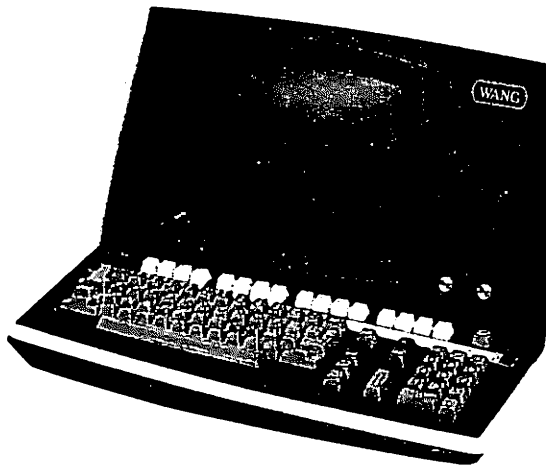


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NO. 186

MODEL 2236DE INTERACTIVE TERMINAL PRODUCT BULLETIN



INTRODUCTION

Wang Laboratories, Inc., is pleased to announce the addition of a new interactive terminal for the 2200VP and 2200MVP family of computer systems. This new microprocessor-controlled terminal offers our customers features not previously available, including:

- . Dual Intensity
- . Reverse Video
- . Underlining
- . Blinking Characters
- . Graphics Character Set
- . Box Graphics
- . Screen Dump to Printer
- . Repeating Keys
- . Self-test Diagnostics

These sophisticated new features can be implemented with a minimum of programming effort because of recent changes in the 2200VP and 2200MVP operating systems.

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Through the use of these new features, it is now possible to easily display BAR Charts. The BOX graphics feature can be used to construct graphic grids, while the alternate character set can display the BAR graphics. Reverse video and bright and blinking attributes can be used to display label information. Previously, this capability was available only on high resolution graphics CRT displays.

The screen dump feature allows the operator to obtain a hard-copy record of the screen display on a printer attached to the terminal. Special programming will no longer be required to provide operators a convenient method for obtaining hard copy output. When software errors occur, the new user can print the screen as it appeared at the time of the failure. The screen dump can also be used when a customer requests a copy of his accounting record.

Providing a well-proven, technically advanced product has been the mainstay of Wang's success, and the Model 2236DE is no exception. By offering advanced design and sophisticated features, Wang will continue to supply the office products of the future, today.

DETAILED PRODUCT DESCRIPTION

The Model 2236DE Interactive Terminal provides several new features not available on its predecessor, the 2236D. These characteristics, being somewhat technical in nature, require special treatment. This document outlines the new features of the 2236DE Terminal, explaining their syntax and function. In some cases, examples are given to further aid the programmer.

1. CHARACTER DISPLAY ATTRIBUTES

In order to highlight information on the screen, the 2236DE provides several display attributes that can be selected for any character displayed on the screen; these are:

- 1) Bright -- characters are displayed in high intensity.
- 2) Blink -- characters blink.
- 3) Reverse Video -- the character background display is white while the character itself is black.
- 4) Underline -- characters are displayed with an underscore.

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The display attribute to be used is selected by sending a command of the following form to the CRT:

```
                OE  
HEX(02 04 xx yy OF)
```

where: xx = 00 if not bright, no blink
 02 if bright
 04 if blink
 0B if bright, blink (not supported by 2236DE)

 yy = 00 if not reverse video, no underline
 02 if reverse video
 04 if underline
 0B if reverse video, underline

The selected display attribute is activated by HEX(OE) in a manner analogous to activating expanded print on certain Wang printers. Characters are output after HEX(OE) is highlighted. If the selection sequence is terminated by HEX(OE), the selected display attribute is immediately invoked and remains in effect until the occurrence of a HEX(OF). Thus, it is possible to highlight a portion of either one or several lines. Subsequent activation of the display attribute by HEX(OE) is terminated by carriage return (HEX(OD)), as well as by HEX(OF).

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Some examples are shown below:

1. LIST D

The 2200 sends out a HEX(OE) at the beginning of the REM% statement. Thus, comment statements appear in the alternate display attribute.

2. 1000 PRINT HEX(OC030E),, "TITLE"

This is an example of a print line appropriate for use with either the new terminal or a printer. For both devices, the alternate attribute is in effect for only the one line generated by statement 1000.

3. 100 PRINT "PROMPT";: LINPUT HEX(OE), A\$: PRINT A\$

The field to be entered appears in the alternate attribute. When entry is terminated with a carriage return, the alternate attribute is cancelled, so the PRINT statement prints A\$ in normal intensity.

4. 150 PRINT HEX(OE); "PROMPT"; HEX (OF);

160 LINPUT A\$

This time, only the prompt appears in the alternate attribute.

Summary of rules governing character attributes:

- 1) HEX(02 04 xx yy OF) selects but does not activate the specified display attribute.
- 2) HEX(02 04 xx yy OE) selects and activates the specified display attribute. HEX(OD) does not turn off the attribute.
- 3) HEX(OF) is used to turn off the display attribute; normal display is then in effect.
- 4) CLEAR, RESET, and screen clear (HEX(03)) select normal display.
- 5) HEX(OE) reactivates the selected display attribute. The attribute remains in effect until the occurrence of a HEX(OF) or HEX(OD).

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- 6) Alternate attributes apply only to codes greater than or equal to HEX(10). Carriage return, line feed, non-destructive space, etc., preserve their meanings. Thus, PRINT AT(may always be used to position the cursor. The third argument of PRINT AT(, used to blank sections of the screen, will work differently depending upon which attribute is currently selected.
- 7) HEX(20) is a destructive space. Programmers should remember, however, that reverse video spaces are white, not black. PRINT TAB(and zoned format PRINT statements (PRINT,) position the cursor with HEX(20)'s, so their effect will vary with the currently active display attribute.
- 8) The operating system considers all codes HEX(00) through HEX(0F) to occupy no space on the output medium. Thus, alternate attribute selection sequences may be included in programs without concern that the operating system may create automatic carriage returns at undesirable times.
- 9) The standard USA, 2236DE uses bright for the default attribute.

2. GRAPHICS CHARACTER SET SELECTION

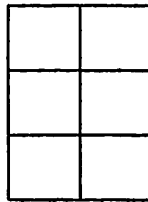
The 2236DE provides the capability to display graphics characters HEX(80) to HEX(FF). The following sequence is used for alternate character set selection:

HEX(02 02 xx 0F)

where: xx = 00 if codes HEX(90) to HEX(FF) are used to underline the normal characters HEX(10) to HEX(7F). 02 if the alternate character set is to be used for codes HEX(80) to HEX(FF).

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Selection of the Graphics character set provides up to 128 characters in addition to the normal characters HEX(00) to HEX(7F). When displayed, graphics characters are extrapolated to fill the entire character position, enabling continuous lines (bars) to be displayed. The standard character graphics set consists of characters representing all the combinations of sixths of a character space where the character space is divided as follows:



The default mode for codes HEX(80) to HEX(FF) is fixed at either normal/underline or alternate character set.

The rules concerning the use of character set selection are as follows:

- 1) HEX(02 02 00 0F) selects the graphic character set to be the normal characters, HEX(10) to HEX(7F) with underline.
- 2) HEX(02 02 02 0F) selects the graphic character set for codes HEX(80) to HEX(FF). This may include character graphics symbols.
- 3) Power on, CLEAR, and RESET select the default mode for codes HEX(80) to HEX(FF).
- 4) The standard USA 2236DE uses normal character/underline as the default selection for codes HEX(80) to HEX(FF). The Graphics Character Set is represented on the chart on the following page.

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STANDARD USA 2236DE UPPER CHARACTER SET

		Normal Characters				Character Graphics			
		80	90	A0	B0	C0	D0	E0	F0
	00								
	01								
	02								
	03								
	04								
Low Order	05								
	06								
	07								
	08								
	09								
	0A								
	0B								
	0C								
	0D								
	0E	β							
	0F								

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3. BOX GRAPHICS

The 2236DE can display continuous horizontal or vertical lines, enabling forms to be drawn or information to be separated by lines or boxes. The horizontal line unit is a line segment the length of a character space, but positioned from the middle of one character space to the middle of the next character space. Horizontal lines are displayed between character lines. Vertical lines are drawn through the middle of a character space; the line coexists with the character at that location. The vertical line unit has the height of a character space.

The terminal allows the programmer to consider the CRT as two displays, a box graphics display and a character display, that just happen to be displayed on the same screen. While in normal character mode, only the characters and their attributes are modified while box graphics remain intact. The one exception to this rule is screen clear, which clears both characters and box graphics. During a box graphics sequence, characters and their attributes are undisturbed.

Because the character and box graphic modes are independent, it is easy to update portions of either display. The third argument of PRINT AT(is useful for clearing portions of the display. Though slower than screen clear, the statement

```
PRINT AT(0,0,)
```

is useful for clearing the characters from the screen without disturbing the box graphics.

A new BASIC-2 Command BOX (height, width) is now available to allow easy implementation of this feature.

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Print Function

General Form:

BOX (height, width)

where: height = expression specifying the height of the box

width = expression specifying the width of the box

Purpose:

The BOX function is used within a PRINT statement to draw or erase a box or line on a CRT which has box graphics capability. The first expression specifies the height of the box; the second is the width of the box. The sign of the arguments determines whether lines are drawn or erased. If the signs are positive, lines are drawn; negative signs cause lines to be erased. If the box height is zero, a horizontal line is drawn or erased. A width of zero causes a vertical line to be drawn or erased. The BOX function positions the box so that the upper left-hand corner is at the current cursor position. Drawing a box does not move the CRT cursor.

Examples:

PRINT BOX (3, 4);	- draws a 3 x 4 box
PRINT BOX (-3, -4);	- erases a 3 x 4 box
PRINT BOX (0, X);	- draws a horizontal line X units long
PRINT BOX (-7, 0);	- erases a vertical line 7 units long
PRINT AT (0, 10); BOX (1, 6); "TITLE"	- displays "TITLE" enclosed in a box

4. SCREEN DUMP

The screen dump feature allows the user to obtain a hard-copy record of the CRT through a local printer. The local printer must be directly connected to the 2236DE terminal through the printer controller, located on the back of the 2236DE. The screen dump is activated by depressing the EDIT key for approximately two seconds. The following sequence describes the screen dump operation:

1. EDIT key depressed and held (immediate click).
2. After approximately two seconds, a second click is sounded to indicate that the screen dump has been activated. (If key is released before two seconds, normal edit functions are invoked.)
3. CRT and Printer buffers are no longer serviced. (Present print job is interrupted.)
4. Carriage Return is transmitted to printer.
5. Top-of-Form is transmitted to printer.
6. The screen contents are printed. (Non-printable characters appear as "#".)
7. Top-of-Form is transmitted to printer.
8. Normal processing resumes.

NOTE

During screen dump, the keyboard remains active. Depressing any key will immediately terminate the screen dump and restore normal processing. The key will be processed normally.

CAUTION:

Normal printing (i.e., background) is interrupted when a screen dump is requested. This means that should a user be printing a report in background through the terminal printer, the screen dump will be inserted into this report. Screen dumps will cause a page eject before and after the dump, yet the user's report may be temporarily halted in the middle of the page. For some reports, this restriction may be acceptable, but for pre-printed forms such as invoices, customer statements, etc., the screen dump could present problems.

5. REPEATING KEYS

All keys on the keyboard, except RESET and EDIT, repeat after an initial delay if held down. This is particularly useful for moving the cursor when editing.

6. COMPETITION

The next several pages provide a feature-by-feature comparison of the Model 2236DE as compared to our major competitors' terminal offerings. This information is designed to give an insight into the positioning of our new product.

Of particular importance is the fact that none of our major competitors offer features similar to our character and BOX graphics. These two features alone can be of major importance for any data entry application. They also provide the ability to develop BAR charts for the graphic display of data.

Simple program modifications can yield extremely impressive screen displays. Users will certainly be proud to have these advanced capabilities.

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INTERACTIVE TERMINAL COMPARISONS

	<u>Wang</u>	<u>Burroughs</u>	<u>Cado</u>	<u>Data 100</u>	<u>Data General</u>	<u>Datapoint</u>	<u>DEC</u>
<u>Display Characteristics</u>							
Characters Arrangement	1920 24x80	480 to 2000 12x40 24x80	1920 24x80	1920 24x80	1920 24x80	960-1920 12x80 24x80	960-1920 12x80 24x80 132
Area	12" diag	4.7x8.4 7.5x9	12" diag 5.25x11.25	14" diag	6x9	3.5x7 5.5x8.35	8.7x4.3 8x4.5
Character Display	192 to 256	64 to 128	96 to 127	96	64	96 to 128	64 to 128
Dot Matrix	5x7	5 x 7	7 x 9	7x9	5x7	5x7	5x7
Reverse Video	Yes	(1)	(2)	No	No	(9)	No
Programmable Brightness	Yes	(1)	Yes	Yes	No	Yes	(11)
Character/Field Blinking	Yes	Yes	Yes	Optional	Yes	Yes	(11)
Roll	Yes	Yes	(3)	No	(8)	Yes	(11)
Cursor Positioning	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cursor Blinking	Yes	Yes	(4)	Optional	Yes	Yes	Yes
Screen Dump	Yes	Yes	Yes	Yes	No	Yes	No
Tabulation	Yes	Yes	Yes	Yes	No	Yes	No
Character Repeat	Yes	Yes	Yes	Yes	Yes	Yes	(12)
<u>Keyboard Characteristics</u>							
Style	Typewriter	Typewriter	Typewriter	Typewriter/ Data Entry	Typewriter	Typewriter	Typewriter/ Data Entry
Character Set	128	128	128	96	64 to 96	128	ASCII
Detachability	No	Yes	(5)	Yes	Yes	No	(13)
Program Function Keys	Yes	Yes	(6)	Yes	Yes	Yes	Yes
Numeric Keypad	Yes	Optional	(7)	N/A	Yes	Yes	(14)
<u>Auxiliary Devices</u>							
Printer	Yes	Yes	Yes	Yes	Yes	Yes	No
Cassette	No	Yes	Optional	No	No	No	No
Diskette	No	No	Yes	Yes	No	Yes	No
<u>Communications</u>							
Mode	Full Duplex ASCII	Half/Full Duplex BSC	Half/Full Duplex BSC	Half/Full Duplex BSC/SDLC	Full Duplex Async.	Half/Full Duplex ASCII	Half/Full Duplex ASCII
Protocol	300-19,200 baud	to 38,400	110 to 9600	to 9600	110-19,200	to 40,800	75 - 9600
Speed (bits/second)							
Estimated Purchase Prices	\$2700	\$3600 to \$4600	N/A	\$3000	\$1900 to \$2200	N/A	\$1400 to \$2100

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INTERACTIVE TERMINAL COMPARISONS (CONTINUED)

Display Characteristics	IBM				Texas Instruments	Four Phase
	Wang	Hewlett/ Packard	Honeywell	Gen. Sys. Div. (GSD)		
Characters Arrangement	1920 24x80	1920 24x80	960 - 1920 12x24 80	240-1920 6x40 24x80	1920 24x80	1152-1920 24x48 80
Area	12" diag	5x10	24x80 12" 5.5x8.5 diag 6x9	9 to 12" diag	6x9	7.25x10.25
Character Set	192 to 256	64 to 512	63-96	64-96	96	125
Dot Matrix	5x7	7x9	5x7/7x9	8x16	7x9	7x9
Reverse Video	Yes	Yes	No	Yes	Yes	No
Programmable Brightness	Yes	Yes	(16)	Yes	Yes	Yes
Character/Field Blinking	Yes	Yes	(17)	No	Yes	Yes
Roll	Yes	Yes	(17)	No	Yes	Yes
Cursor Positioning	Yes	Yes	(17)	Yes	Yes	Yes
Cursor Blinking	Yes	Yes	(17)	Yes	Yes	Yes
Screen Dump	Yes	(15)	(17)	Yes	Yes	Yes
Tabulator	Yes	(15)	(17)	Yes	Yes	Yes
Character Repeat	Yes	(15)	Yes	Yes	Yes	Yes
Keyboard Characteristics						
Style	Typewriter	Typewriter	Typewriter	Typewriter	Typewriter	Typewriter
Character Set	128	128	128	EBCDIC	128	ASCII/EBCDIC
Detachability	No	Yes	(17)	Yes	No	Yes
Program Function Keys	Yes	Yes	Yes	Yes	Yes	Yes
Numeric Keypad	Yes	Yes	(18)	Yes	Yes	Yes
Auxiliary Devices						
Printer	Yes	Yes	(19)	Yes	Yes	Yes
Cassette	No	No	No	No	Yes	No
Diskette	No	No	(20)	Yes	No	Yes
Communications						
Mode	Full Duplex ASCII	Half/Full Duplex ASCII/BSC	Half/Full Duplex ASCII/Honeywell	Half/Full Duplex BSC/SDLC	Half/Full Duplex ASC/BSC	Half/Full Duplex BSC/SDLC
Speed (bits/second)	300-19,200 baud	110 to 9600	75-9600	to 9600	110-4800	1200 - 9600
Estimated Purchase Price (000)	\$2700	\$2500 to \$6000	\$1500 to \$8700	\$3100 to \$4200	\$2700 to \$4200	\$4900

\$2.4 to \$1.9

* See page following chart for notes.



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1. Not available on Burroughs TD 730; Standard on TD 830.
2. Not available on Cado System 20; Standard on System 40.
3. Roll up only, on the Cado System 20.
4. Optional on Cado System 20; not available on the System 40.
5. Not available on Cado System 20; optional on System 40
6. 16 on Cado System 20, not available on System 40.
7. Standard on Cado System 20, optional on System 40.
8. Data General terminals offer roll up as a standard feature.
9. Standard on the Datapoint 1500. No information is available on other terminals.
10. BSC/SDLC is available on the Datapoint 1150/1170. SDLC is not available on the Datapoint 1500.
11. Roll up is standard on DEC VT-50. Roll is not available on the VT-52/55 and DS 78. Roll up, as well as programmable brightness and character field blinking, are standard on the VT-100.
12. Character repeat is not available on DEC VT 50. It is standard on all others.
13. Detachable keyboard is only available on DEC VT 100.
14. The numeric keypad is standard on the VT 52/55/etc. It is not available on the VT-50.
15. Screen dump tabulation and character repeat are standard on all H/P displays. It is optional on the 2649A display.
16. Programmable brightness is not available on some Honeywell terminals.
17. Many of these features are not available on the Honeywell V/P 7100/7105, and 7200 terminal. Standard on most models are cursor positioning and tabulation.
18. A numeric keypad is not available on the Honeywell V/P 7100/7105. It is standard on all other terminals from Honeywell.
19. Printers are not available on the Honeywell V/P 7100/7105, and 7200. They are optional on the V/P 7760, and standard on the V/P 7700 and V/P 7700R/7705R.
20. Diskettes are only available in the Honeywell V/P 7760.
21. Cursor positioning is available on all DPD terminals. Some have limited capability. Cursor blinking is standard only on the IBM 3274 terminal.
22. Program function keys are optional on the IBM 3275 and 3276 terminals. They are standard on the 3271 and 3274.

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Feature	Benefit
1. Character Attributes	. Improve interactivity by highlighting important information via blinking, bright, reverse video and underline, or combinations of these.
2. Alternate Character Set	. Allows the display of graphics characters for special formats and Bar charts.
3. Box Graphics	. Allow lines to be drawn on CRT for forms design or data separation. Make information easy to locate on CRT.
4. New BASIC-2 Command (PRINT), BOX (X, Y)	. Allows easy implementation of BOX Graphics.
5. Microprocessor Controlled	. Allows the CRT to control functions, thus freeing the MVP CPU to process data of other terminals and/or partitions. Provides self-test diagnostics at power on time.
6. Dual Intensity	. Allows information to be highlighted in bright or regular intensity.
7. Dual Display Mode Character/Box Graphics	. Alters displayed information without effecting BOX Graphics and vice versa.
8. Screen Dump	. User does not need to manually transcribe displayed information. The information may be printed by depressing one key.

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2236DE Specifications

CRT

Display Size - 12 in. diagonal (30.4 cm)
Capacity - 24 lines, 80 characters/line

Character Size

Height - 0.16 in. (0.41 cm)
Width - 0.09 in. (0.23 cm)

Character Set

128 characters, including upper/lowercase letters; each character assigned one or more attributes for high- or low-intensity display, blinking, reverse video, or underlining. Additional, alternate character set consisting of 64 graphic characters. Also capable of displaying line-segment (box) graphics, separate from either character set.

Transmission Rate

Manually selectable for each terminal at 300, 600, 1200, 2400, 9600, or 19,200 baud.

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Cable

One 8-foot (2.4 m) cord to power source. One 25-foot (7.6 m) direct connection cable is provided with each Model 2236DE, unless an optional direct connection cable is ordered for a terminal. Nonextendable cables are optionally available in 100-foot (30.5 m) increments for direct connection up to 2,000 feet (609.6 m). Modem cables are optionally available in lengths of 12 feet (3.7 m), with extensions of 25 feet (7.6 m) and 50 feet (15.2 m); however, combined cable distance from Wang equipment to a modem is 50 feet (15.1 m) maximum according to EIA standards.

<u>Length</u>	<u>Part No.</u>
25 feet	120-2236-25
50 feet	120-2236-50
100 feet	120-2236-1
200 feet	120-2236-2
300 feet	120-2236-3
400 feet	120-2236-4
500 feet	120-2236-5
600 feet	120-2236-6
700 feet	120-2236-7
800 feet	120-2236-8
900 feet	120-2236-9
1000 feet	120-2236-10

Extended length cables are also available in the following lengths:

<u>Length</u>	<u>Part No.</u>
1,250 feet	120-2236-11
1,500 feet	120-2236-12
1,750 feet	120-2236-13
2,000 feet	120-2236-14

UPGRADES

Upgrades of existing Model 2236D terminals to 2236DE capabilities are NOT possible. NO upgrades will be offered.

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2236DE Product Statistics

Model Number:	2236DE
Part Number:	177-3236DE
Release Date:	June 15, 1979
Availability:	August 1, 1979
Classification:	Electrical
Warranty:	Standard