

PRODUCT DATA SHEET

INTRODUCTION

The Model 2236DE interactive terminal offers Wang customers a versatile improvement of the 2236D terminal that includes graphics capabilities not normally offered on terminals in its price range. While maintaining all the features of its popular predecessor, the Model 2236DE gives the programmer the ability to create highlighted displays, to utilize special graphic characters, or to draw boxes at any screen location. Screen displays may be altered using various commands to allow maximum flexibility of program output.

CRT DISPLAY

Wang's Model 2236DE Interactive Terminal contains a 12-inch (30.4 cm) diagonal measure, Cathode Ray Tube (CRT) screen display for operator prompting and verification. The CRT displays a full 128-character set, including uppercase and lowercase keyboard characters, some foreign language characters, special symbols, and underlining. The CRT also displays an alternate character set of graphic characters and "box" graphics. All characters may be displayed using one or more of several character display attributes.

The CRT has a 24-line, 80 characters-per-line capacity (1920 character positions) for full-screen operator prompting and verification of keyed characters. Brightness and contrast controls provide a sharp, clear image on the screen. Display speed is approximately 2,000 characters per second at 19,200 baud. A cursor (resembling an underscore) is used to indicate the location on the display where the next character will appear. The cursor can be programmably turned off and on for special applications.

TERMINAL KEYBOARD

The keyboard supports both uppercase and lowercase alphabetic characters. Control functions are handled by several types of function keys. The alphabetic keyboard has two modes of operation, selected by a toggle switch labeled "A/A" and "A/a". In the A/A mode, alphabetic characters are produced as uppercase whether shifted or unshifted. Shifted numerics produce symbols and special characters. In A/a mode, the keyboard functions as a standard

2200

MODEL 2236DE INTERACTIVE TERMINAL

Microprocessor-Controlled, Interactive Terminal
Extensive Graphic Capabilities, Box and Character
Reverse Video and Character Display Attributes
Screen Dumps to Local Printer
Repeating Keys and Underlined Characters
Self-Test Diagnostics



WANG

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up any display space, so a programmer need not worry about alignment problems caused by attributes using display space.

GRAPHIC CAPABILITIES

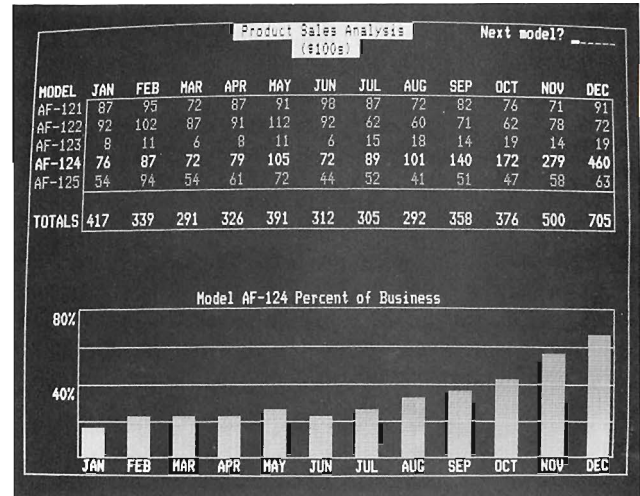
The Model 2236DE terminal makes use of both an alternate character set and normally unused portions of each character position to create remarkable graphics capabilities for a terminal in its price range. Box graphics allow line segments to be drawn at any CRT position. Character graphics are an alternate character set which display geometric designs rather than the normal characters.

Box Graphics

Box graphics are used for drawing horizontal or vertical lines on the screen, enabling forms to be depicted or fields to be separated by lines or boxes. Horizontal lines are drawn between character lines on the CRT screen, while vertical lines are drawn through the center of character positions. Since the horizontal lines are not drawn through portions of the existing characters, characters contained within the confines of a box will not interfere with the line segments. For example, within a boxed area used to highlight a prompt, the prompt may be rewritten a number of times without altering or erasing the box itself. Consequently, box graphics may be used to increase the readability of a dense display without greatly reducing the capacity of that display. A special BASIC-2 statement, the PRINT BOX statement, can be used to draw any size box beginning at the current cursor location on the screen.

Character Graphics

Character set graphics comprise an alternate set of display characters on the Model 2236DE terminal. They are similar to standard characters in that each character graphic occupies one position on the CRT display. Character graphics are created by dividing the normal character position into six equal areas (three vertically by two horizontally). Certain character codes then cause one or more of these areas to be displayed on the screen at the current cursor position. Adjacent areas of two graphic characters will touch, as will areas in two character positions next to each other on the CRT, creating continuous light or dark areas on the screen. This characteristic permits the construction of bar graphs and special displays. When combined with display attributes, character graphics are useful for histograms and other similar displays.



TERMINAL/CPU INTERFACE

Each Model 2236DE Interactive Terminal is connected to either a Model 2236MXD Terminal Processor or a Model 22C32 Triple Controller. These devices handle I/O operations between the CPU and the terminals and buffer data entered from or transferred to the terminals. The 2236MXD is used on the 2200MVP CPU, where up to eight interactive terminals may be used (four per terminal processor). The Model 22C32 Triple Controller supports a single terminal and can be used on the 2200VP or the 2200MVP CPU.

Model 2236DE terminals can be attached locally to the CPU at distances of up to 2,000 feet (609.8 m) or remotely via modems and telephone lines. Communication between the terminal and the CPU is asynchronous, full-duplex, with selectable line speeds ranging from 300 to 19,200 bits per second. To accelerate communications between the terminals and the CPU, the system performs automatic data compression on information transmitted to each terminal. Each Model 2236DE can support its own local printer, and hard copy and CRT displays can be created concurrently at each terminal site. A dump of the screen to the local printer may be initiated from the keyboard, resulting in the printing of all standard characters present on the screen. The screen dump feature requires no special software and can be performed at any time.

The Model 2236DE terminal and its controller employ microprocessors to optimize data throughput. For example, strings of four or more identical bytes are compressed for transmission into three-byte blocks. A

ready/busy protocol controls information flow between the terminals and the terminal processor so that it is not necessary for the printer attached to the terminal to keep up with the serial communication line data rate. These features are automatic and are completely transparent to the BASIC program executing in the 2200 CPU.

As an added feature, the Model 2236DE performs self-testing diagnostics every time it is powered on. These diagnostics ensure that the terminal is in optimal condition before it is used. If the unit fails one of the tests, a continuous alarm sounds, alerting the user to the failure. The tests allow a Wang Customer Service Representative to quickly identify the problem to minimize downtime.

The Model 2236DE also incorporates a redesigned power supply, which relies on convection of air for cooling, rather than a noisy fan. Thus, the Model 2236DE terminal is much quieter in operation than other terminals.

Any standard Wang printer or plotter with a 36-pin cable connection may be plugged into the printer connector on the Model 2236DE Interactive Terminal. A Wang-supplied direct-connection cable or an optional modem cable plugs into a RS-232-C compatible connector on the terminal.

MODEL 2236DE SPECIFICATIONS

Size

Height 13.5 in. (34.3 cm)
Depth 20.5 in. (52.1 cm)
Width 19.8 in. (50.3 cm)

Weight

51 lb (23.1 kg)

CRT

Display Size 12.0 in. diagonal (30.5 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.

Power Requirements

115 or 230 VAC \pm 10%
50 or 60 Hz \pm 0.5 Hz
40 Watts

Fuses

2 amps @ 115 V/60 Hz
1 amp @ 230 V/50 Hz

Transmission Rate

Manually selectable for each terminal at 300, 600, 1200, 2400, 4800, 9600, or 19,200 baud.

Character Format

1 Start Bit, 8 Data Bits, Odd Parity, 1 Stop Bit

Operating Environment

50° to 90° F (10° to 32° C)
20% to 80% relative humidity, noncondensing, allowable
35% to 65% relative humidity, noncondensing, recommended

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 1,000 feet (304.9 m). Additional direct connection cables are available in lengths of 1,250 feet (381.1 m), 1,500 feet (457.3 m), 1,750 feet (533.5 m) and 2,000 feet (609.8 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 (15.2 m) maximum according to EIA standards.

ORDERING SPECIFICATIONS

A terminal with an integrated Cathode Ray Tube (CRT) display screen, and an Upper/Lowercase keyboard with a numeric keypad. The CRT must be capable of displaying 24 lines, each 80 characters in length, and measure 12 inches diagonally. Seventeen Special Function keys must be under program control and be easily accessed from the keyboard. Upper and lowercase alphabetic and special characters must be capable of being keyed and displayed on the terminal screen. The terminal must contain, in addition to the standard character set, an alternate set consisting of 64 graphic characters each composed of one or more of six square divisions of the character position. Line-segment graphics must be able to be drawn on in each character position without interference from character commands. Each character position must have assigned a character display attribute which allows high- or low-intensity display, blinking or non-blinking, underlining, and standard or reversed video.

Options available must include a direct cable connection of up to 2,000 feet between CPU and terminal, modem cable connections, and printers.

Standard Warranty Applies

Wang Laboratories reserves the right to change specifications without prior notice.



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INTRODUCTION

The Model 2236DE Interactive Terminal, developed by Wang Laboratories, Inc., enables a user to communicate with a 2200MVP, LVP, SVP, or VP Central Processing Unit (CPU). The Model 2236DE gives the programmer the ability to create highlighted displays, to utilize special graphic characters, or to draw boxes at any screen location. Screen displays may be altered using various commands to allow maximum flexibility of program output. Other special features of the terminal include screen dumps to a local printer, self-test diagnostics, and repeating keys.

CRT DISPLAY

The Model 2236DE Interactive Terminal contains a 12-inch (30.5 cm) diagonal measure Cathode Ray Tube (CRT) screen display. The CRT displays a full 128-character set, including uppercase and lowercase keyboard characters, some foreign language characters, special symbols, and underlining. The CRT also displays an alternate character set of graphic characters and box graphics. All characters may be displayed using one or more of several character display attributes.

The CRT has a 24-line, 80 characters-per-line capacity (1920 character positions) for full-screen operator prompting and verification of keyed characters. Brightness and contrast controls provide a sharp, clear image on the screen. Display speed is approximately 2,000 characters per second at 19,200 baud. A cursor, resembling an underscore, is used to indicate the location on the display where the next character will appear. In addition to controlling cursor movement and positioning from the keyboard, a number of codes can be used to manipulate the cursor under program control for specially formatted displays.

TERMINAL KEYBOARD

The Model 2236DE keyboard supports both uppercase and lowercase alphabetic characters. Control functions are handled by several types of function keys. The alphabetic keyboard has two modes of operation, selected by a toggle switch labeled A/A and A/a. In A/A mode, uppercase alphabetic characters are produced, whether the keyboard is shifted or unshifted. Shifted

2200

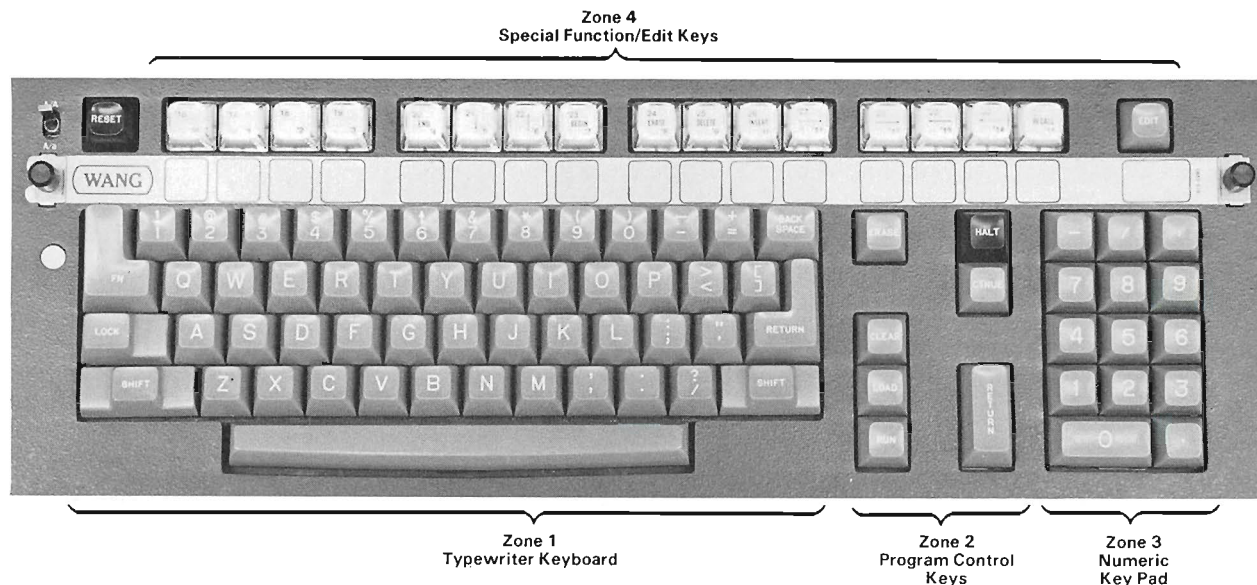
MODEL 2236DE INTERACTIVE TERMINAL

- Microprocessor-Controlled
- Box and Character Graphic Capabilities
- Character Display Attributes
- Screen Dumps to Local Printer
- Repeating Keys and Underlined Characters
- Self-Test Diagnostics
- Quiet Operation
- Remote or Local Hook-up



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Model 2236DE Keyboard

numeric keys produce symbols and special characters. In A/a mode, the keyboard functions as a standard typewriter, producing uppercase and special characters when shifted, and producing lowercase and numeric characters in unshifted operation.

The keys are well designed and are ideally suited for high-speed typing or data entry. Positive response keys provide adjustable audio feedback when they are touched with sufficient pressure to ensure entry of a character. An experienced typist need not "bottom out" a key to ensure entry, thereby increasing input speed and lessening the need to verify entry by checking the CRT. A program-controlled audio alarm with adjustable volume can also be used to minimize operator monitoring by signaling when special conditions occur.

The Model 2236DE keyboard allows characters to be underlined with a single keystroke before keying the character to be underlined. Accented characters on non-English versions of the keyboard may be entered in the same manner. All keys on the Model 2236DE keyboard will repeat if held down for more than one-third of a second. The microprocessor in the terminal adjusts the repeat interval according to the data transfer rate, sounding the keyboard clicker each time the character is transmitted. Thus, the user can both see and hear the character being repeated.

The Model 2236DE integrated keyboard, as illustrated, is divided into four zones. The first zone contains alphanumeric characters and some special characters, arranged as a standard typewriter keyboard. Zone 2 consists of seven program control keys. The third zone is a numeric keypad designed for rapid entry of numbers. Zone 4 is comprised of sixteen Special Function keys, which can be used by the programmer to perform up to 32 user-defined functions. For example, Special Function keys can be defined to initiate program execution, access subroutines, or enter a predefined text string. (The key labeled "FN" in Zone 1 can also be used as a Special Function key.)

The Special Function keys in Zone 4 also are used as Edit mode operator keys. The Edit mode provides powerful capabilities for editing Immediate mode statements and alphanumeric characters either in a line of program text resident in memory or in the line of text currently being entered. Insertion and deletion of characters, non-destructive spaces and backspaces, and line-to-line movement of the cursor may be performed in Edit mode. In a 2200MVP or LVP configuration, actual line-editing functions are performed by the terminal processor; in a 2200VP or SVP configuration, the system CPU performs the editing. Except for the FN key, the Special Function keys are disabled in Edit Mode and the keys take on their designated editing functions.

MODEL 2236DE SPECIFICATIONS (Cont.)

Transmission Rate

Manually selectable for each terminal at 300, 600, 1200, 2400, 4800, 9600, or 19,200 baud

Character Format

1 start bit, 8 data bits, odd parity bit, 1 stop bit

Cabling

One 8-foot (2.4 m) cable 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 available optionally in 100-foot (30.3 m) increments for direct connection up to 1,000 feet (303.0 m). Additional direct connection cables are available in lengths of 1,250 feet (378.8 m), 1,500 feet (454.5 m), 1,750 feet (530.3 m) and 2,000 feet (606.1 m).

Modem cables are available optionally in lengths of 12 feet (3.7 m), with extensions of 25 feet (7.6 m) and 50 feet (15.2 m). Maximum combined cable distance from Wang equipment to a modem is 50 feet (15.2 m), according to EIA standards.

ORDERING SPECIFICATIONS

The interactive terminal must contain an integrated Cathode Ray Tube (CRT) display screen, and an uppercase/lowercase keyboard with a numeric keypad. The CRT must be capable of displaying 24 lines, each 80 characters in length, and measure 12 inches diagonally. Seventeen Special Function keys, which can access 34 user-defined functions, must also be available. Uppercase and lowercase alphabetic and special characters must be capable of being keyed and displayed on the terminal screen. The terminal must contain, in addition to the standard character set, an alternate set consisting of 64 graphic characters each composed of one or more of six square divisions of the character position. Line-segment graphics must be able to be drawn on in each character position without interference from character commands. Each character position must have a character display attribute assigned which allows high- or low-intensity display, blinking or non-blinking, underlining, and standard or reversed video. Screen dumps to a local printer, self-test diagnostics, and repeating keys must all be standard features.

Standard Warranty Applies

(606.1 m), or remotely via modems and telephone lines. However, terminals connected to a 2200SVP or VP CPU can only be attached locally at a maximum distance of 50 feet (15.2 m) and 2,000 feet (606.1 m) respectively. Communication between the terminal and the CPU is asynchronous and full-duplex, with selectable line speeds ranging from 300 to 19,200 bits per second. To accelerate communications between the terminals and the CPU, the system performs automatic data compression on information transmitted to each terminal. Each Model 2236DE can support its own local printer; hard copy and CRT displays can be created concurrently at each terminal site. A dump of the screen to the local printer may be initiated from the keyboard, resulting in the printing of all standard characters present on the screen. The screen dump feature requires no special software and can be performed at any time.

The Model 2236DE and its controller employ microprocessors to optimize data throughput. For example, strings of four or more identical bytes are compressed for transmission into three-byte blocks. A ready/busy protocol controls information flow between the terminals and the terminal processor. Thus, it is unnecessary for the attached printer to keep up with the serial communication line data rate. These features are automatic and are completely transparent to the BASIC program executing in the 2200 CPU.

As an added feature, the Model 2236DE performs self-testing diagnostics every time it is turned on. These diagnostics ensure optimal terminal condition before use. If the unit fails one of the tests, a continuous alarm sounds, alerting the user to the failure. The tests allow a Wang Customer Service Representative to quickly identify the problem and minimize downtime.

The Model 2236DE also incorporates a redesigned power supply, which relies on air convection cooling, rather than a noisy fan. Thus, the Model 2236DE terminal operates much quieter than other terminals.

Any standard Wang printer or plotter with a 36-pin cable connection may be plugged into the printer connector on the Model 2236DE Interactive Terminal. A Wang-supplied direct-connection cable or an optional modem cable plugs into a RS-232-C-compatible connector on the terminal.

MODEL 2236DE SPECIFICATIONS

Size

Height	13.5 in. (34.3 cm)
Depth	20.5 in. (52.1 cm)
Width	19.8 in. (50.3 cm)

Weight

51 lb (23.1 kg)

CRT

Display Size	12.0 in. diagonal (30.5 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 uppercase and lowercase letters; each character is 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 and other special symbols is supplied. Also capable of displaying line-segment (box) graphics, separate from either character set.

Power Requirements

115 or 230 VAC \pm 10%
50 or 60 Hz \pm 1.0 Hz
50 Watts

Fuses

2 amps (SB) @ 115 V/60 Hz
1 amp (SB) @ 230 V/50 Hz

Operating Environment

Temperature	50° to 90° F (10° to 32° C)
Relative Humidity	35% to 65% noncondensing (recommended) 20% to 80% noncondensing (allowable)

CHARACTER DISPLAY ATTRIBUTES

The Model 2236DE terminal defines a character display attribute for each position on the CRT display. By using special codes before displaying a character or string of characters, the programmer can cause the output to be bright or normal intensity, blinking or non-blinking, underlined, or reversed video (dark characters on a light field). More than one attribute may be assigned to a particular screen location to allow, for example, both reversed video and blinking portions on a screen intended for close examination. Error messages, input fields, and other special messages can have particular attention drawn to them by using the appropriate character attributes. Character attributes do not take up any display space, so a programmer need not worry about alignment problems caused by attributes using display space.

GRAPHIC CAPABILITIES

The Model 2236DE terminal uses both an alternate character set and normally unused portions of each character position to create remarkable graphics capabilities for a terminal in its price range. Box graphics allow line segments to be drawn at any character position. Character graphics are an alternate character set which display geometric designs rather than the normal characters.

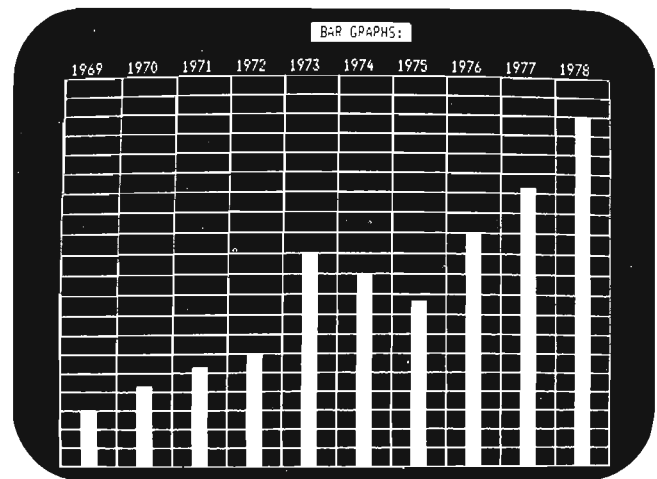
Box Graphics

Box graphics are used for drawing horizontal or vertical lines on the screen, enabling forms to be depicted, or fields to be separated by lines or boxes. Horizontal lines are drawn between character lines on the CRT screen, while vertical lines are drawn through the center of character positions. Since the horizontal lines are not drawn through portions of the existing characters, characters contained within the confines of a box will not interfere with the line segments. For example, within a boxed area used to highlight a prompt, the prompt may be rewritten a number of times without altering or erasing the box itself. Consequently, box graphics may be used to increase the readability of a dense display without greatly reducing the capacity of that display. A special BASIC-2 statement, the PRINT BOX statement, can be used to draw any size box beginning at the current cursor location on the screen.

Character Graphics

Character set graphics comprise an alternate set of display characters on the Model 2236DE terminal. They

are similar to standard characters in that each character graphic occupies one position on the CRT display. Character graphics are created by dividing the normal character position into six equal areas (three vertically by two horizontally). Certain character codes then cause one or more of these areas to be displayed on the screen at the current cursor position. Adjacent areas of two graphic characters will touch, as will areas in two character positions next to each other on the CRT, creating continuous light or dark areas on the screen. When combined with display attributes, character graphics are useful for the construction of bar graphs, histograms, and other special displays.



TERMINAL/CPU INTERFACE

Each Model 2236DE Interactive Terminal is connected to either a Model 2236MXD Terminal Processor or a Model 22C32 Triple Controller when configured with a 2200MVP, LVP, or VP Central Processing Unit. These devices handle I/O operations between the CPU and the terminals, and buffer data entered from or transferred to the terminals. The Model 2236MXD is used on the 2200MVP CPU, where up to twelve interactive terminals may be used (four per terminal processor). The Model 2236MXD is also used on the 2200LVP, where four interactive terminals may be used. The Model 22C32 Triple Controller supports a single terminal and can be used on the 2200VP, MVP, and LVP CPU. The Model 2236DE plugs directly into the terminal connector on back of the SVP CPU; no additional controllers are necessary.

Model 2236DE terminals can be attached locally to the 2200MVP or LVP CPU at distances up to 2,000 feet

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