

Wang Laboratories, Inc. is the only small business computer manufacturer to offer customers *two* cost-effective approaches to fulfilling multi-user application requirements. When highly independent tasks which require extensive processing must be run simultaneously with maximum throughput, Wang's popular programmable Workstation may often be the answer. In addition to the powerful multi-processing Workstation, the extremely cost-effective Wang Model 2236 Interactive Terminal system is an excellent choice for situations where a single task, or similar, related tasks controlled within the same program must be run at multiple terminal sites. Of course, no single approach is always perfectly suited to the diversity of multi-user business applications, but only Wang offers the choice of either multi-processing or multi-terminals.

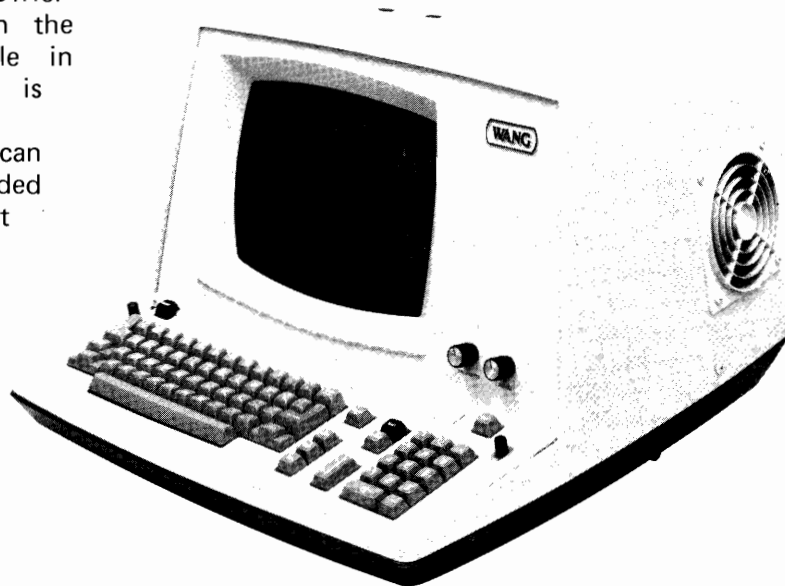
The remainder of this document explains the Wang Interactive Terminal approach to multi-user, multi-terminal applications.

### CPU REQUIREMENTS AND CONFIGURATIONS

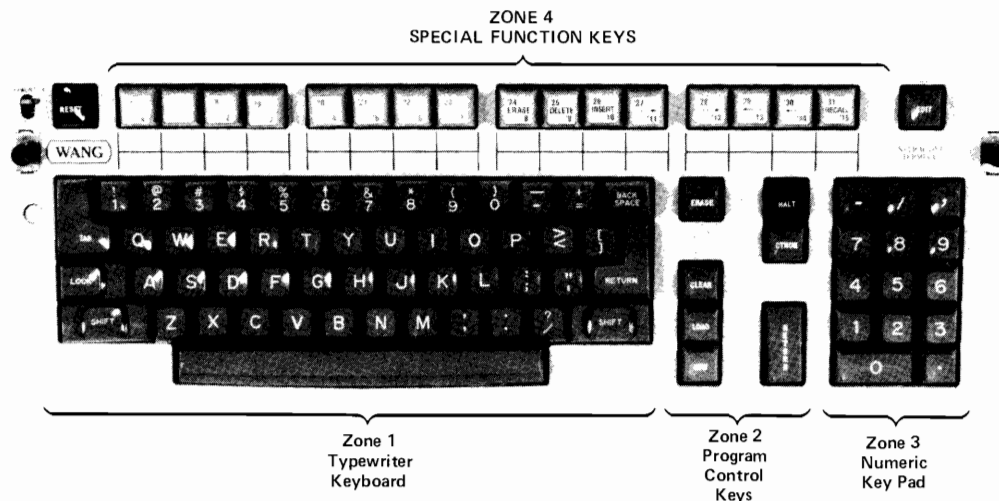
A single Wang 2200 Central Processing Unit (CPU) equipped with a Model 2236MXC Multiplex Controller can control a network of up to either four (2200T) or eight (2200VP) Model 2236 Interactive Terminals, depending on the CPU used. Up to four Interactive Terminals can perform a typical single-task application under the control of a Wang System 2200T CPU or Wang System 2200S with Option 24. For applications where extensive processing must occur between operator entries, the Wang System 2200VP CPU is recommended to increase overall performance. For applications which require from five to eight Interactive Terminals, a Wang 2200VP is required. In all cases, the multiple-terminal network is controlled by the BASIC Language program which resides in the 2200 CPU. Different tasks controlled within the same program are possible in one network if a 2200VP is used.

Each Interactive Terminal can be located in a local, extended local, or remote environment relative to the 2200 CPU. In addition, Teletype<sup>®</sup> compatible terminals may be controlled in the same network as the Wang Interactive Terminals by the CPU-resident BASIC Language program.

<sup>®</sup> Trademark of the Teletype Corporation.



# MODEL 2236 INTERACTIVE TERMINAL & MODEL 2236 MXC MULTIPLEX CONTROLLER



## SYSTEM OVERVIEW

The operator console of each Interactive Terminal contains a 12-inch (30.4cm) diagonal measure Cathode Ray Tube (CRT) screen for operator prompting and verification, and a typewriter-arranged keyboard with a separate numeric keypad to accept operator-keyed input. Control functions are handled by several types of function keys. Coordination of terminal polling functions, display of operator-prompting messages at each terminal, and return of complete entry fields to the CPU are handled by the microprocessor-based Model 2236MXC Multiplex Controller in conjunction with the BASIC Language program in 2200 CPU memory. The Model 2236MXC Multiplex Controller provides a full overlap capability whereby the Multiplex Controller receives and buffers keyed data while the CPU processes the previous line, for all terminals. Polling and display controls including cursor positioning are supported by the supplied Terminal Access Method (TAM) subroutines, which are efficiently incorporated into BASIC Language application programs.

In addition to a microprocessor, the Model 2236MXC Multiplex Controller contains separate input and output buffers for each terminal, and also handles full-duplex asynchronous communication with each Teletype-compatible or Wang Interactive Terminal at speeds up to 9600 baud. Full-duplex communication indicates two independent communication channels; specifically, one channel communicating keyed characters to the input buffer, while the other channel simultaneously transfers the output buffer's contents to the appropriate display screen coordinates of that terminal. The combination of independent buffering and high-speed full-duplex communication allow uninterrupted keying with simultaneous display use from each Interactive Terminal.

## MODEL 2236 INTERACTIVE TERMINALS

The overall operator-orientation of the Interactive Terminal is best revealed by its individual system input and output components. Input to the system occurs via the keyboard, which has superior arrangement and touch. The keyboard consists of four

zones: (1) a typewriter-like keyboard, (2) program control function keys, (3) a numeric keypad, and (4) a row of Special Function Keys, as shown in the picture. A keyboard clicker automatically produces a sound when a valid key is touched.

The main source of system output to the operator, the 24 line, 80 character per line CRT display enables full-screen operator prompting and validation of keyed characters. The screen measures 12 inches (30.4cm) diagonally and displays 1920 character positions. The display and keyboard support both upper and lowercase alphabetic characters. Formatted displays providing operator "prompts" and defined entry fields are easily programmed using supplied Terminal Access Method (TAM) subroutines, which support cursor-positioning as well as the display of default values in place of defined entry fields. Associated keyboard electronics and display logic are, of course, contained within the Interactive Terminal housing.

An audio alarm is provided to gain the operator's attention when special conditions occur, and is program-controlled by a HEX (07) code. Brightness and contrast controls provide a sharp, clear image on the screen. Display speed is approximately 1,000 characters per second at 9600 baud. Any standard Wang printer may be optionally plugged into an Interactive Terminal, in which case print lines up to 156 characters are supported.

## CENTRAL PROCESSING UNIT (CPU)

The centrally-located 2200 CPU must be equipped with a Model 2236MXC Multiplex Controller. A CRT screen console for the 2200 CPU is *not* required because BASIC program input, using full 2200VP EDIT capability, occurs only from the first Interactive Terminal in the network. The first Interactive Terminal also acts as a system I/O control console for initialization purposes when the 2200 CPU is powered ON. Once a program which controls all network terminals is loaded, the first terminal functions as would any other terminal in the network. Thus the 2200 CPU, Multiplex Controller, and first Interactive Terminal jointly control the network of application-oriented Interactive Terminals.

## MODEL 2236MXC MULTIPLEX CONTROLLER

Consisting of one microprocessor, communication electronics, and separate input and output buffers for each terminal, the Model 2236MXC Multiplex Controller is available in two versions. The Model 2236MXC-1 supports up to four Interactive Terminals using one I/O slot of the 2200 CPU. Supporting up to eight Interactive Terminals, the Model 2236MXC-2 may be used only with a 2200VP CPU and occupies two I/O slots. Because all multiplexer electronics are contained on the controller boards, neither a separate chassis nor a power supply is required.

The Multiplex Controller microprocessor coordinates data transfer between the CPU, the Multiplex Controller I/O buffers, and each terminal. It therefore performs fully overlapped processing duties by leaving the CPU free to perform other tasks, such as range checks on the previously-entered line, while it handles full-duplex asynchronous communication and buffering for all other Interactive Terminals. Each terminal's 256-byte input buffer accepts keyed input, while its output buffer concurrently displays characters on the respective terminal's CRT screen.

The Multiplex Controller, and thus the Interactive Terminals, are programmable through supplied Terminal Access Method (TAM) subroutines. TAM subroutines are easily incorporated into user-written BASIC Language programs, and simplify programming a multi-terminal configuration because of their modular functions. Terminal polling using TAM, which is usually done on an equal priority basis, does allow timing priorities among the terminals. TAM also provides display control functions and returns keyed messages of up to 80 characters to the user's program.

The Model 2236MXC Multiplex Controller accommodates either the fixed screen Wang mode or the Teletype mode — the choice of which is selectable for each terminal under software control. In the Teletype mode, Teletype or Teletype-compatible terminals are controlled by the BASIC Language/TAM subroutine program in the 2200 CPU. Teletype characteristics supported include screen line roll, output line length up to 255 characters (plus CR), several forms of back-spacing including rub-out, and recognition of standard Teletype ASCII codes. In the Wang mode, Interactive Terminal functions are controlled by the BASIC Language/TAM subroutine program. Characteristics associated with the Interactive Terminals include screen line roll, as well as the fixed screen, multiple input field features associated with masked screen data entry. Only the Wang Interactive Terminals can use the versatile cursor positioning features supported by the TAM subroutines.

### COMMUNICATION SPEEDS AND CONNECTIONS

Line handling between the 2200 CPU and each Interactive Terminal is asynchronous full-duplex at up to 9600 baud. Each Interactive Terminal can be situated in a local, extended local, or remote environment relative to the 2200 CPU. In all cases, the four

or eight plugs at the Multiplex Controller and the plug at the Interactive Terminal are 25-pin, RS-232-C compatible. A description of each type of connection follows.

If the cable distance between the 2200 CPU and an Interactive Terminal is less than 25 feet (7.6m), transmission rates of 9600 baud occur with direct four-wire connection using a supplied cable. For cable distances beyond 25 feet up to 1,000 feet (304.8m), optional cables are available in 100 foot (30.5m) increments to provide direct extended local connection at speeds of 9600 baud. For cable distances beyond 1,000 feet, modems must be used to provide the remote communication link. Direct connection uses four-wire, twisted, shielded cable.

Two categories of modems may be optionally purchased for short distance or remote connections. Short-haul modems use private four-wire connection and must be asynchronous, full-duplex, RS-232-C compatible modems. For such connections, Multiplex Controller baud rates are factory-wired at 9600 baud, but upon installation may be set at either 300, 600, 1200, 2400, or 4,800 baud by a Wang Service Representative for each terminal. Each Interactive Terminal's baud rate is under manual user control, and must equal the baud rate set for that terminal at the Multiplex Controller.

For true remote connections, telephone lines provide connection between the RS-232-C compatible asynchronous full-duplex modems operating at the same baud rate.

In both cases, two modems are required for each connection between the 2200 CPU and Interactive Terminal. Cable is optionally available for modem connections to Wang equipment at 12 feet (3.7m), with optional extensions of 25 feet (7.6m), and 50 feet (15.2m). Two lengths of modem cable for each Interactive Terminal connection provide the necessary link between the Multiplex Controller (CPU) and its modem, and between the Interactive Terminal and its modem. Modem cable is 25-pin RS-232-C compatible.

### 2236 SPECIFICATIONS

#### Size

Height . . . . . 13½ in. (34.3 cm)  
Depth . . . . . 20½ in. (52 cm)  
Width . . . . . 19¾ in. (50.2 cm)

#### Weight

51 lb (23.1 kg)

#### CRT

Display Size . . . . . 12 in. diagonal (30.4 cm)  
Capacity . . . . . 24 lines, 80 characters/line  
Character Size  
Height . . . . . 0.16 in. (0.4064 cm)  
Width . . . . . 0.09 in. (0.2286 cm)

#### Power Requirements

115 or 230 VAC ± 10%  
50 or 60 Hz ± ½ Hz  
40 Watts

#### Fuses

2.5 a. @ 115V/60 Hz  
1.2 a. @ 230V/50 Hz

# DATA SHEET

## 2236 SPECIFICATIONS (Cont.)

### Operating Environment

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

### Cable

- One 8 foot (2.4m) cord to power source.
- One length of 25 feet (7.6m) direct connection cable is provided with each Model 2236, unless an optional direct connection cable is ordered for that terminal. Cables are optionally available in 100 foot (30.5m) increments for direct connection up to 1,000 feet (304.8m) and are non-extendable. Modem cables are optionally available in lengths of 12 feet (3.7m), with extensions of 25 feet (7.6m) and 50 feet (15.2m); however, combined cable distance from Wang equipment to its modem is 50 ft (15.2m) maximum according to EIA standards.

## 2236MXC SPECIFICATIONS

### Operating Environment

- Same as 2200 CPU

### Power Requirements

- Operates using CPU Power Supply

### Communication Modes

- Full-Duplex Asynchronous Wang mode for Model 2236's.
- Full-Duplex Asynchronous Teletype mode for Teletype-compatible terminals.

### Number of I/O Slots Required

- Model 2236MXC-1 requires one I/O slot and supports up to four terminals.
- Model 2236MXC-2 requires two I/O slots and supports up to eight terminals (2200VP only).

*Standard Warranty Applies*

## ORDERING SPECIFICATIONS

An integrated Cathode Ray Tube (CRT) and Upper/Lowercase keyboard with numeric keypad. The CRT must be capable of displaying 24 lines, each 80 characters in length, and measure 12" diagonally. Sixteen Special Function keys and one general-purpose function key 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 Model 2236 console. Program control keys must also be provided, because one Wang Interactive Terminal is required to act as the system control console for each CPU network.

The Model 2236MXC Multiplex Controller must be field-upgradable in existing 2200 CPU's. It must be available in four and eight terminal versions, and must provide local direct wire connection at communication speeds of 9600 baud. It must contain one microprocessor and communication electronics, as well as the following for each possible terminal: one 256-byte input buffer and a separate output buffer for display and printer purposes. For non-clocked (short-haul) modem use, it must provide speeds at either 300, 600, 1200, 2400, 4800, or 9600 baud for each terminal. Communication must be asynchronous, full-duplex in either Wang or Teletype compatible modes, which are software selectable. BASIC Language subroutines must be supplied to facilitate display controls, polling functions, and handle data transfer functions. This software must contain a cursor positioning subroutine for use in the Wang asynchronous mode.

Options available must include direct cable connection up to 1,000 feet between CPU and terminal, modem cable connections, as well as printers.

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



LABORATORIES, INC.

ONE INDUSTRIAL AVENUE, LOWELL, MASSACHUSETTS 01851. TEL. (617) 851-4111. TWX 710 343-6769. TELEX 94-7421

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