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SYSTEM 2200

HARDWARE

POCKET GUIDE

WANG

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HOW TO USE THIS POCKET GUIDE

This Pocket Guide is a concise reference to the units available as components of Wang 2200 and WCS Systems. Consoles and peripherals are all described. This guide is a companion to the Wang BASIC Language Pocket Guide which describes the prominent features of BASIC available on Wang Systems.

Both Pocket Guides are intended as general introductions to the special features of Wang Systems; other documents such as data sheets, the BASIC Reference Manual, the Wang System Configuration Guide, the Device Address Guide and the System 2200 Summary (card of BASIC syntax) should be used for more detailed information. A BASIC Programming Manual gives fundamental information to the user who does not know programming, and the Software Handbook describes software and utilities available from Wang, SWAP or vendors.

Among the more sophisticated Wang-supported software packages, are the following:

- KFAM (Keyed File Access Method) which provides extremely rapid file-search capability to disk-based systems.
- DISK SORT UTILITY which optimizes sorting on disk.
- REGRESSION which provides twelve routines to do both simple and multiple regression analysis.
- NINE-TRACK TAPE UTILITIES which provide tape labelling, media interchange and tape reading and writing capabilities for IBM-compatible nine-track tape.

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INTRODUCTION

Your Wang System is an advanced calculating system that offers BASIC as the keyboard programming language. Console units are compact and can be combined with a large assortment of versatile peripherals to provide computer configurations specially tailored to user needs. The units are so designed that no special wiring is needed; any unit can be attached to a standard AC wall plug.

The compactness and functional design of each unit makes possible complete control of the system by the user; the user can thoroughly control use of the system. The system has further been designed to be interactive: a large size 1024-character TV-like video display or Cathode Ray Tube (CRT) instantly displays program text or data, a handy keyboard facilitates operator input of programs and data and the close-to-English BASIC language is easy to use. With these features, learning time is brief; operators can be running programs after a minimum of training and programmers can be using the system within days, if not hours.

In addition to the usual peripherals found in most computer systems such as keyboards and printers, the Wang product line includes a whole family of disk drives, card readers, plotters, tape cassette drives, a paper tape reader, a digitizer, a nine-track tape drive, I/O (input/output) interface controllers, a TC (telecommunications) controller and multiplexers. The interface controllers provide the capability to interface a Wang system with an RS-232-C compatible Teletype or with external devices such as counters, digital clocks, digital voltmeters, etc., or other Wang CPU's; the TC controller permits a Wang system to act as an "intelligent" programmable terminal for transmissions over direct or telephone lines. The nine-track tape drive can be used to interchange data between a Wang system and a large-scale computer; and multiplexers permit multiple CPU's to share a single peripheral such as a disk or a printer.

THE CENTRAL PROCESSING UNIT

The heart of a Wang System is its CPU (Central Processing Unit); located in this unit are the BASIC language, hardwired in ROM (Read-Only Memory), the peripheral interfaces, and user-dedicated RAM (Random Access Memory). About 700 bytes of RAM are used for 'housekeeping' to interface ROM and RAM. Since your system is a ROM-machine, once it is turned on it is 'up'; there is no need to wait for a system language or operating system to be loaded before the computer can be used.

ASCII code is used to store program and data bytes in memory. Most BASIC keywords are stored as single eight-bit bytes, even when entered character-by-character. This utilizes memory to its fullest and makes program storage extremely efficient. Decimal arithmetic is used throughout so that loss of precision due to binary to decimal conversions is eliminated. Internal execution speeds for arithmetic operations (at full 13-digit precision) are given in the specifications.
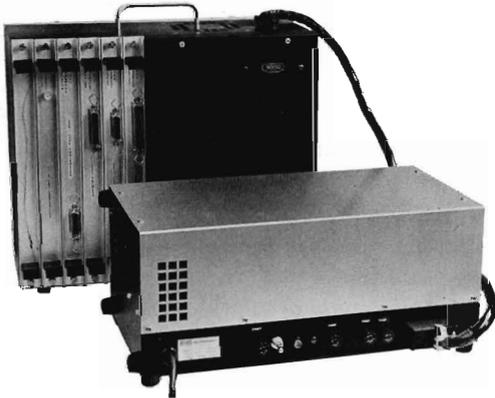
The CPU of any 2200C is attached to a Power Supply which provides the power from line voltage to run the system; a 2200S or T normally contains a combined CPU and power supply in a single unit.

DISPLAY UNITS

There are a variety of units available to display programs and data with Wang Systems. Video displays come in two sizes and can either be obtained in a separate unit or combined in a console with a keyboard. Each CRT presents up to 16 lines, each up to 64 characters long and instantly displays any programs and data. As each new line is entered, it appears on the next unused line on the screen. If the screen is full, the topmost line disappears and all remaining lines move up to accommodate the new line. The new line appears at the bottom of the screen. Errors of syntax in BASIC or certain operational faux pas trigger the display of error codes on the CRT. (In addition to the usual English/BASIC language CRT's described below, Wang also offers CRT's in Russian/BASIC and Katakana (Japanese)/BASIC, on special order.)

On all CRT's, control codes can activate cursor movement and clear the display. Every unit also has controls to permit adjustment of brightness and contrast of the screen.
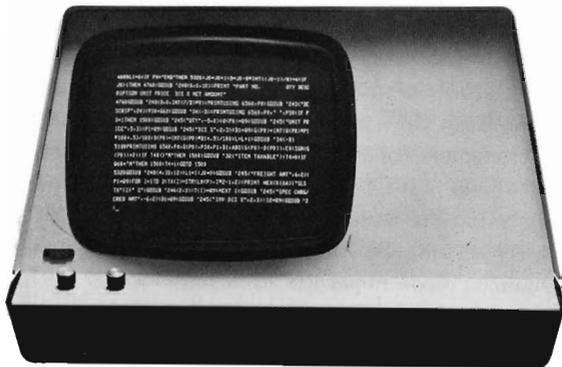
MODEL 2216

The *Model 2216 CRT Executive Display* outputs numeric and alphanumeric material on a 12 inch (30.5 cm) diagonal CRT. With uppercase letters, numerals and special characters, a 58-character set is provided.

Character Set
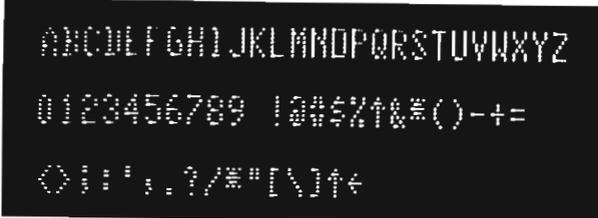
MODEL 2216A

The Model 2216A Upper/Lowercase CRT displays programs and data in both upper and lowercase characters on a 12 inch (30.5 cm) diagonal CRT. Certain special characters not available on the Model 2216 CRT or on Wang keyboards such as braces { } can also be output on this unit.
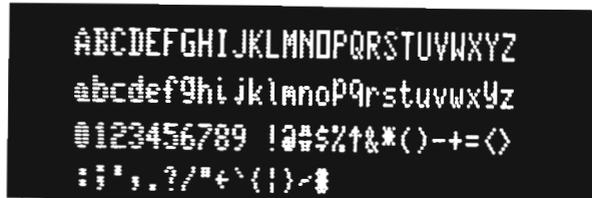
Character Set

MODEL 2216/2217

The *Model 2216/2217 Combined CRT Executive Display/Single Tape Cassette Drive* provides a 12 inch (30.5 cm) diagonal CRT and a tape cassette drive in a single unit. The cassette drive dual-records all data or programs to provide high data reliability; a cassette can hold up to 76,000 bytes of information (equivalent to about 20 pages of character data). In addition to the usual display controls, this unit contains buttons to open the cassette drive door and for high speed tape rewind.

MODEL 2216A/2217

The *Model 2216A/2217 Combined Upper/Lowercase CRT/Single Tape Cassette Drive* provides a 12 inch (30.5 cm) diagonal CRT with upper/lowercase capability and a tape cassette drive in a single unit. This unit combines all the features found separately in the Model 2216A and 2216/2217. The character set is that shown for the Model 2216A.

OPTION 4

Any unit containing either a Model 2216 or 2216A CRT can be fitted with *Option 4*, a programmable *Audio Signal*. Activated by the transmission of HEX(07), the ASCII Bell Code, from the System, the Audio Signal sounds a 960 Hz beep for a fraction of a second. A sequence of HEX(07) codes can be used to produce a longer signal or a series of beeps.

MODEL 2220

The *Model 2220 Integrated Console* provides a 9 in. (22.9 cm) diagonal CRT in a single unit with a Single Tape Cassette Drive and an Alphanumeric/BASIC Keyword Keyboard. When combined with a CPU, this unit provides a minimum-configuration computer. Brightness and contrast controls, and buttons for cassette drive door opening and high-speed cassette rewind are all provided. A keyboard control switch provides the capability to write program lines with BASIC Keyword and uppercase keys, or to generate text lines in upper and lowercase characters (when Option 30 is available).

Character Set

MODEL 2226

The *Model 2226 CRT/Keyboard Console* provides a 12 in. (30.5 cm) diagonal CRT in a single unit with an Alphanumeric/BASIC Keyword Keyboard. Brightness and contrast controls permit adjustment of the display. A keyboard control switch provides the capability to write program lines with BASIC keyword and uppercase letters, or to generate text lines in upper and lowercase characters (when Option 30 is available).

Character Set

DISPLAY UNITS (Cont.)

MODEL 2292

The *Model 2292 Auxiliary Display* is a 12 in. (30.5 cm) diagonal 'slave' CRT that can be attached to any Wang CRT controller. The Auxiliary Display displays whatever is on the primary system CRT. Up to ten such Auxiliary Displays can be 'daisy-chained' to a single controller, up to a maximum of 500 feet (152.4 m) from the controller.

OPTION 30

Option 30 the *Upper/Lowercase CRT Display* provides the upper/lowercase capability to the Models 2220 and 2226.

Character Set

OPTION 31

Option 31 the *Audio Signal* provides a programmable signal tone to the Models 2220 and 2226 (see additional description for Option 4).

BUNDLED SYSTEMS

WCS/10

The *WCS/10, Wang Computer System Model 10,* contains a 9 in. (22.9 cm) diagonal CRT combined in a single unit with an Alphanumeric/BASIC Keyword Keyboard, a minimum CPU with 4K RAM and 24K ROM, and a Single Tape Cassette Drive. The unit is placed on a specially designed table. A keyboard control switch provides the capability to write program lines with BASIC keywords as well as character by character. When the upper/lowercase option (OP-30) is available, the control switch facilitates the generation of upper/lowercase text for the display. Two additional peripherals can be added to this unit along with Options 20, 21, 22, 23, 24, 30 and 31.

WCS/20

The *WCS/20, Wang Computer System Model 20,* contains a 12 in. (30.5 cm) diagonal CRT combined in a single unit with an Alphanumeric/BASIC Keyword Keyboard, a minimum CPU with 8K RAM and 42.5K ROM, and a single 262-kilobyte diskette. The units are placed in a specially designed table. A keyboard control switch provides the capability to write program lines with BASIC keywords and uppercase characters. When the upper/lowercase option (OP-30) is available, the control switch facilitates the generation of upper/lowercase text on the display. In addition to the standard units, up to four additional peripherals can be attached to this bundled Wang system.

WCS/30

The *WCS/30, Wang Computer System Model 30,* contains a 12 in. (30.5 cm) diagonal CRT combined in a single unit with an Alphanumeric/BASIC Keyword Keyboard, a minimum configuration CPU with 16K RAM and 42.5K ROM, and a single 262-kilobyte diskette. The units are placed in a specially designed table. A keyboard control switch provides the facility to write program lines with BASIC keywords and uppercase characters. When the upper/lowercase option is available, the control switch facilitates the generation of upper/lowercase text on the display. Separate components of this system include a 5 Megabyte Fixed/Removable Disk and a Matrix Impact Printer. Up to three additional peripherals, in addition to the standard units, can be attached to this bundled Wang system.

KEYBOARD

MODEL 2223

The *Model 2223 Alphanumeric/BASIC Keyword Keyboard* combines a standard typewriter keyboard and a BASIC Keyword Keyboard. Thirty-four BASIC keywords have been placed on the keys of the standard QWERTY typewriter; a control switch additionally permits the entry of both upper and lowercase characters on systems with this capability.

PRINTING OUTPUT DEVICES

A variety of output devices is available for use with Wang Systems. These units provide printed output of program listings or of output data with several character sets.

MODEL 2201

The *Model 2201 Output Writer* is a modified IBM Selectric® typewriter. It can output a line up to 157 characters (about 13 in. or 33 cm) long and can be programmed to produce tabulated and specially formatted output. The Model 2201 uses Prestige Elite as the standard character set and operates at a rate of approximately 13 char/sec. When not under program control it can be used manually as a typewriter.

Character Set

```
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
0123456789 -][@#$%¢&*()_+=
°!:;"',.?/
```

MODEL 2202

The *Model 2202 Plotting Output Writer* combines the features of an IBM Selectric® typewriter with those of a four-quadrant digital plotter. Plotting accuracy is ± .01 in. plus .00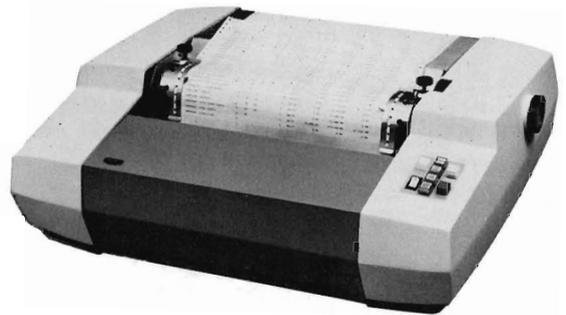3 in./in. (± .0254 cm plus .003 cm/cm) with a rate of approximately 400 (.01 in.) steps per second. It uses the Prestige Elite character set and can type at a rate of approximately 13 char/sec. A pin-feed platen is used to ensure exact movement of paper in the Model 2202. It can also be used manually as a typewriter.

Character Set

```
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
0123456789 []@#$%¢&*()_-+=
°!:;"',.?/
```
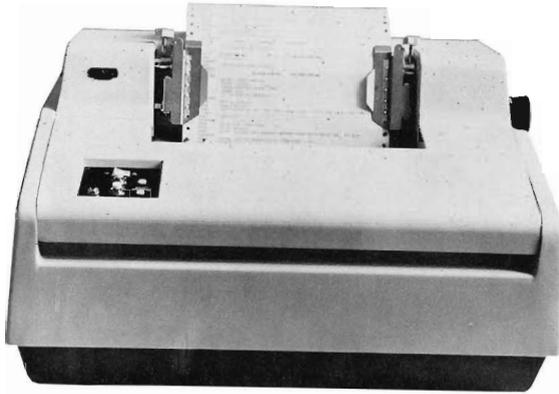

MODEL 2221W

The *Model 2221W Line Printer (132 column)* is a matrix impact printer which produces output at a rate of approximately 200 char/sec (60 to 300 lines/min). It utilizes a 9 x 9 (nominal) dot matrix to generate a 96-character set of both upper and lower-case letters, numbers and special characters, and can produce highlighted print of double-width characters under program control. Zero and the letter 'O' are significantly different in the standard character set. Its many standard features include a CLEAR switch (to clear the print buffer), an alarm lamp (for malfunctions), a paper-out lamp, an audio tone, pin-feed units, vertical format control with automatic page eject, a paper rack, a manual line feed switch, both manual and programmable top-of-form, a quiet servo-motor and deselection without data loss. Paper in the Model 2221W can be 5 to 14 7/8 in. (12.7 to 37.8 cm) wide.

Character Set

```
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
0123456789 !@#$%↑&*()-+=<>
';:/?.," _`{|}~\][`
Sample of
Expanded Print
```
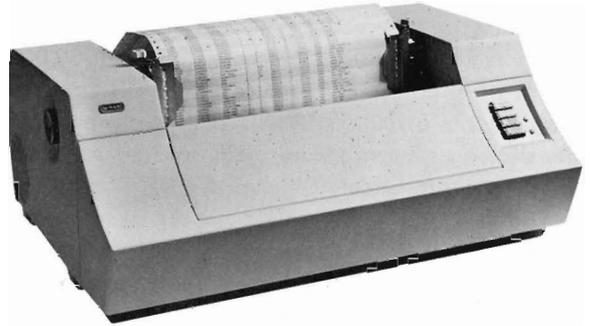
MODEL 2231

The *Model 2231 Line Printer (80 column)* is a small matrix impact printer which produces output at a rate of approximately 100 char/sec (60 to 150 lines/min). It utilizes a 5 x 7 dot matrix to generate uppercase letters, numbers and special characters, and can produce highlighted print with double width characters under program control. Its standard features include pin-feed units, vertical format control and paper-out lamp. Paper in the Model 2231 can be 4 1/2 to 9 in. (11.4 to 22.9 cm) wide.

Character Set

```
ABCDEFGHIJKLMNOPQRSTUVWXYZ
0123456789  !@#$%^&*()-+=<>
 ´ ; : / ? . , " _
```

MODEL 2261

The *Model 2261 High-Speed Printer* is a matrix impact printer which produces output at a rate of approximately 330 characters/sec (125 lines/min ± 10%). It utilizes a 9 x 7 dot matrix to generate uppercase letters, numbers and special characters and can produce highlighted print with double-width characters under program control. The Model 2261 uses two print heads operating in unison to print a 132 character line. Each head travels only half the paper width, then prints in reverse on the next line. The standard features include pin feed units, vertical format control, automatic motor shut-off (to minimize noise) and a paper-out lamp and tone. Paper can be 4 to 14 7/8 in. (10.2 to 37.8 cm) wide.

Character Set

```
ABCDEFGHIJKLMNOPQRSTUVWXYZ
0123456789  !@#$%^&*()-+=<>
 ´ ; : / ? . , " ÷ [ \ ] ^
SAMPLE OF
EXPANDED PRINT
```

DISK DRIVES

A number of versatile disk units are available for use with Wang Systems. They cannot be run on a 2200A and require the use of Option 24, the Disk ROM, to be used on a System 2200S or a WCS/10. The disk drives utilize either hard disks or diskettes, depending on the model. The smallest diskette unit has a capacity of one-quarter megabyte (260,000 bytes) of information; the largest hard disk unit, 10 megabytes (10 million bytes). Diskettes are about the size of a 45 rpm record; hard disks are about 15 in. (38 cm) in diameter. Disks are easy to store and handle and disk-based operations are significantly faster than those based on tape cassette drives. Disks further provide random access storage rather than the serial storage provided by the slower and more cumbersome cassette drives. Disks are described in order of increasing capacity.

MODEL 2270

The *Model 2270 Diskette Drive* comes in three configurations −1, −2 and −3 to provide 0.2, 0.5 and 0.7 megabyte capacity on a small disk drive. These units are available with bundled Wang Systems WCS/20 and WCS/30.

MODEL 2230

The *Model 2230 Fixed/Removable Disk Drive* contains two disk platters with a total capacity of up to 5 megabytes (5 million bytes). The unit can be obtained in three configurations with storage capacities of 1, 2.5 and 5 megabytes. In each configuration, half the storage capacity is on the fixed disk, and half on the removable disk. Removable disks can be interchanged to provide off-line storage; they can be reused or updated as needed.

TAPE CASSETTE DRIVES

Two models of tape drives to read and write programs and data on tape cassettes are available. These units provide a low cost sequential storage medium to Wang systems; all material is dual-recorded to prevent loss of data or programs and to permit certain kinds of recovery from such loss. The system automatically formats both data and programs for the user. A single tape cassette can contain up to 76,000 bytes of information, while a program can be 'named' with its name recorded on the cassette for later recall. Each tape unit is provided with buttons for door release and high speed rewind.

MODEL 2217

MODEL 2260

The *Model 2260 Fixed/Removable Disk Drive (10 megabyte)* provides the maximum number of bytes available on any Wang disk unit. As with the Model 2230, storage capacity is shared between the fixed and the removable disk and removable disks provide infinitely expandable off-line storage.

The *Model 2217 Single Tape Cassette Drive* is a single unit containing a single drive. Tapes recorded on this unit can be read on all other Wang cassette drives, whether the unit is in the console or in the Dual Tape Cassette Drive. This model is frequently combined in the CRT unit console.

MODEL 2218

The *Model 2218 Dual Tape Cassette Drive* is a single unit containing two tape cassette drives, providing a unit more compact and inexpensive than a pair of Single Tape Cassette Drives. The unit needs only a single controller slot in the CPU peripheral chassis for its use, even though it contains two drives.

CARD READERS

Card readers available for connection to Wang systems include readers with capabilities to read mark sensed and/or 80-column punched cards, depending on the model. These units provide the capacity to input programs or data to the Wang System in card form. Cards can be prepared manually or on a standard IBM keypunch. Card reader operation is significantly improved on any 2200S or WCS/10 with Option 22; operation of card readers on a 2200A is limited.

MODEL 2234A

The *Model 2234A Hopper-Feed Punched Card Reader* reads either Hollerith or binary 80 column punched cards at a rate of about 5 cards per second. Hollerith and binary characters are automatically converted to the ASCII internal code used in Wang systems. Up to 550 cards can be stacked in the input and output hoppers at one time; cards can be added to and removed from the hoppers during operation to permit continuous input.

MODEL 2244A

The *Model 2244A Hopper-Feed Mark Sense/ Punch Card Reader* is a unit on which both mark sense and punched cards can be read. It provides the facility to read 80 column Hollerith punched cards, binary punched cards, and mark sense cards with or without timing marks. It operates at a rate of about 5 cards per second, with input/output hopper capacity of 550 cards at a time. The vacuum picker mechanism used for cards movement has a high tolerance for mutilated, warped and edge-damaged cards; stapled cards are automatically rejected without card damage. Cards can be added to and removed from the hoppers during operation to permit continuous input.

PUNCHED TAPE READER

This unit provides the facility for Wang Systems to read punched tapes in both forward and reverse direction. Reading is done optically and the unit can accommodate standard ASCII and non-standard punched tape sizes and codes. The unit cannot be run on a 2200A and Option 22 must be available to use it on a 2200S or WCS/10.
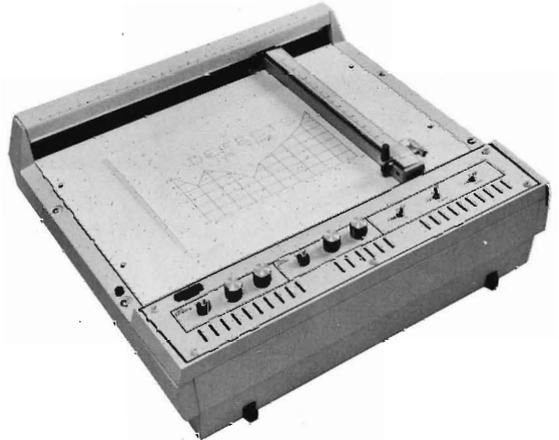

MODEL 2203

The *Model 2203 Punched Tape Reader* reads punched tape at a rate of about 300 characters/sec, reading in either forward or reverse direction. It reads standard one-inch, eight-channel tape punched in ASCII code as well as certain narrower non-standard punched tapes. Reading is done optically.

PLOTTERS

In addition to the Model 2202 Plotting Output Writer which can function as a digital plotter, two flatbed plotters are available for use with Wang Systems. To run either of these plotters on any 2200S or WCS/10, Option 22, the Advanced Programming ROM, must be available; the plotters cannot be run on a 2200A.

MODEL 2212

The *Model 2212 Analog Flatbed Plotter* provides the capability to plot continuous lines and points. With Wang supported utilities, pie charts, bar graphs and three dimensional diagrams can be drawn under program control. The unit has a maximum plotting area of 10 in. by 15 in. (150 sq in.) [25.4 cm by 38.1 cm (968 sq cm)] and a plotting accuracy of ± 0.2% of full scale. Alphanumeric data can be plotted with characters of different sizes, and diagrams can be automatically scaled by manual setting of the appropriate length of each axis. The pens provided with the unit come in two colors and are fiber-tipped. Paper is held down on the plotter surface by a low voltage potential, eliminating the need for magnets or tape.

MODEL 2232A

The *Model 2232A Digital Flatbed Plotter* provides continuous line and point plotting over a 31 by 48 inch surface (1488 sq in.) [78.7 by 121.9 cm (9590 sq cm)]. Under program control, the plotter can produce bar charts, graphs of functions, pie charts, etc. and do complete alphanumeric labelling. This plotter has an accuracy of + .01 in. plus .001 in./in. (+ .025 cm plus .001 cm/cm) and can plot with a variety of pens (fiber tip, ball point, drafting) in the pen holders supplied. Large flat magnets are provided with the plotter to hold paper or mylar to the plotting surface. The plotting surface is a special smooth microporous vinyl that has the capacity to eliminate small nicks or pock marks by self-restoration.

DIGITIZER
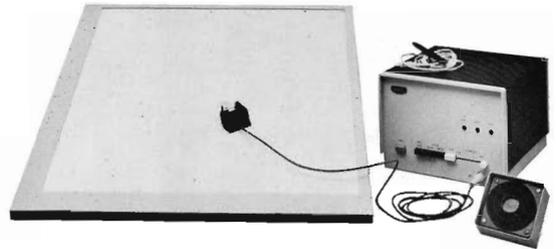
MODEL 2262

The *Model 2262 Digitizer* converts the physical location of points on the digitizer tablet to digital information in cartesian coordinates (x and y). It is available in three tablet sizes: 20 by 20 in. or 400 sq in. [50.8 cm or 2580 sq cm], 30 by 40 in. or 1200 sq in. [76.2 by 101.6 cm or 7742 sq cm], and 36 by 48 in. or 1728 sq in. [91.4 by 121.9 cm or 11142 sq cm]. The digitizer is provided with both a hand-held cursor and a pen stylus, either of which can be used to trace graphs or diagrams placed on the tablet. Three operating modes are provided with the digitizer: Single Point, to digitize discrete points across the tablet surface; Switch Stream, to digitize continuously as long as the pen stylus or cursor push button is pushed down; and Stream, to digitize continuously without manual intervention. A fine grid of wires is permanently imbedded inside the digitizer tablet to ensure high reliability and accuracy. The use of this unit with a 2200S, 2200A or WCS/10 is limited; its operation can be improved on a 2200S or WCS/10 with Option 22, 23 or 24.

NINE-TRACK TAPE DRIVE

MODEL 2209

The *Model 2209 Nine-Track Tape Drive* provides IBM compatible nine-track capability to Wang Systems. Tapes written conform to the ANSI standard and are written and read at 800 bpi. This unit requires the use of General I/O statements and at least 12K user RAM (random access memory) to support Wang tape utilities. Wang supported utilities to read and write nine-track tapes and to transfer data from card and disk to tape, and tape to disk as well as a printing tape dump, are available. This unit can accommodate tape reels up to 10.5 in. (26.7 cm) in diameter.

MULTIPLEXERS

The multiplexer makes it possible for a number of CPU's to share a single peripheral device such as a disk drive. Not available on any 2200A, it can be obtained on a 2200S or a WCS/10 only if Option 24 is available; the multiplexer can be used on any other Wang System.
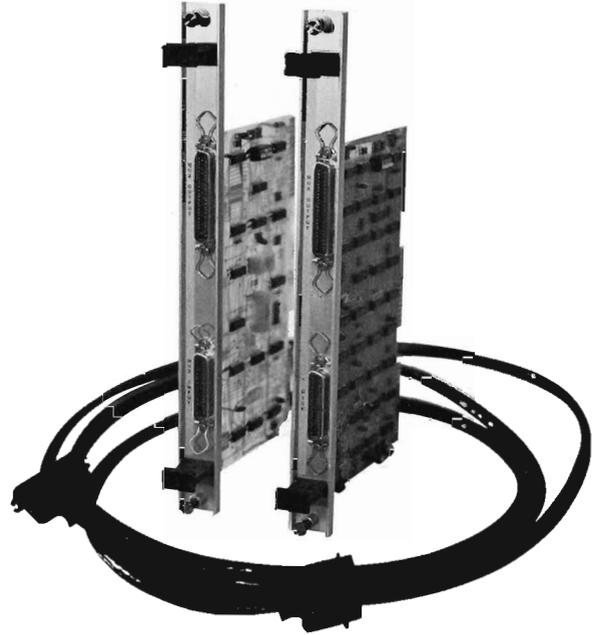

MODEL 2230MX

The *Model 2230MX Disk Multiplexer* can provide multiplexing capabilities without the availability of a Hog Mode Switch. CPU's can share the same data base for efficient file interrogation and updating. This unit can be daisy chained with maximum length of the daisy chain of 500 feet (152 m).

INTERFACE CONTROLLERS

Several interface controllers are available to Wang Systems to interface Wang CPU's with non-Wang equipment such as Teletype® equipment, terminals and laboratory instruments.
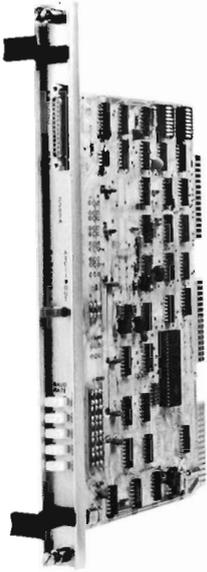
MODEL 2207A

The *Model 2207A I/O Interface Controller (RS-232-C, selectable baud)* can be used to transmit ASCII characters or binary data between a Wang CPU and RS-232-C compatible serial type external devices such as a Teletype. Transmissions of input or output can proceed at asynchronous selectable rates up to 1200 baud. This unit can operate only in a limited fashion on a 2200A; its use on a 2200S or WCS/10 is limited unless Option 22 is available.

MODEL 2250

The *Model 2250 I/O Interface Controller (8-bit parallel)* allows direct input and output of sequential characters between external peripherals and a Wang CPU. Characters must be eight-bits each and are transferred under program control. Data in any code format including ASCII can be transmitted at rates up to 10,000 char/sec. To obtain maximum transfer rates, the CPU should contain Option 2 or Option 23. This controller can be used with any System 2200 or WCS, but its use is limited without the General I/O Instruction Set.

INTERFACE CONTROLLERS (Cont.)

MODEL 2252A

The *Model 2252A Scanning Input Interface Controller (1 to 10 BCD digit parallel)* allows external devices such as digital voltmeters to be directly connected to a Wang CPU, for input only, and permits the user to select the number of BCD digits to be transmitted. It can be used in a scanning mode to sample a group of instruments where sampling rates are greater than 50 milliseconds. The Controller accepts data consisting of a sign and up to ten BCD digits or up to 40 bits of binary information in parallel. It can be used on any System 2200 or WCS, but its use on a 2200A is limited.

TC CONTROLLER

This Controller makes it possible for the user to transmit and receive ASCII character data from a Wang CPU over telephone lines under program control, and to communicate with other Wang CPU's or other computer systems.
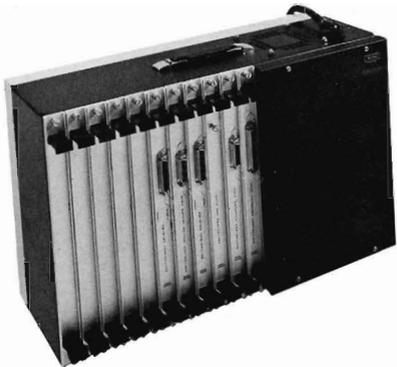

MODEL 2227

With the *Model 2227 Telecommunications Controller,* a 2200 or WCS system can act as a programmable terminal for asynchronous data transmission and reception via telephone or direct-connection lines at selectable rates of 100, 150, 300, 600 and 1200 baud. Character structure of 5 to 8 data bits, stop bits and parity are selectable. Virtually any character codes can be transmitted and received. For full use, the CPU should contain Option 2 or Option 23 (the General I/O Instruction Set); it can be used on any System 2200, but its use with a 2200A is limited. To locally connect two 2227's (in two separate Wang CPU's), the Model 2227N (the Null Modem) is required. For data transfer over telephone lines, either a data set or an acoustic coupler must be used.

EXTENDED CHASSIS

The primary 2200 CPU chassis contains six slots for I/O peripherals. To make possible a large variety of system configurations, several chassis extenders are available.

MODEL 2219

The *Model 2219 I/O Extended Chassis* provides five additional I/O slots and can be used with any 2200 A, B, or C.

OPTION 20

Option 20 provides three additional I/O slots to a 2200S or WCS/10.

OPTION 20A

Option 20A provides three additional I/O slots to any 2200T, WCS/20 or WCS/30. On a 2200S or WCS/10 already containing Option 20, Option 20A provides three additional I/O slots.

STANDS

To make Wang configurations compact and convenient to operate, CPU and peripheral stands are available.

MODEL 2290

The *Model 2290 CPU/Peripheral Stand* can contain the entire CPU and interface chassis along with the Power Supply. This stand eliminates the 'snake pit effect' when a complex group of peripherals are wired into one CPU and makes it possible to turn on the entire system with a single switch.

MODEL 2291

The *Model 2291 Plotter Stand* is for use with large flatbed plotters. It provides a stable base on which the plotter can rest with no danger of warping.

CENTRAL PROCESSOR SPECIFICATIONS

Average Execution Times (at full 13-digit precision)

Operation	Time
add	0.8 ms
subtract	0.8 ms
multiply	3.9 ms
divide	7.4 ms
square root	46.4 ms
x^y	45.4 ms
e^x	25.3 ms
$\log_e x$	23.2 ms
integer	0.24 ms
absolute value	0.25 ms
sign	0.25 ms
sine	28.3 ms
cosine	38.9 ms
tangent	78.5 ms
arctangent	72.5 ms
read/write cycle	1.6 μ sec

(ms = millisecond = 1/1000 second,
μ sec = microsecond = 1/millionth second)

Memory Size
    4,096 bytes (expandable to 32K)

Peripheral Capacity
    1 to 6 (expandable to 11 max) for 2200A,B,C
    1 to 3 (expandable to 9 max) for 2200S,T

CENTRAL PROCESSOR SPECIFICATIONS (Cont.)

Largest Line Number
    9999

Magnitude of Largest Number
    10^{99}

Magnitude of Smallest Number
    10^{-99}

Precision
    13 significant digits

Maximum Nesting of FOR-NEXT loops and subroutines
    50 levels

Maximum length of alpha variable
    64 characters

Storage Code
    ASCII

Size of Byte
    8 bits

Type of Arithmetic
    Decimal

System Language
    BASIC