

WCS/25 Technical Information

Wang Computer Systems



WCS/25

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The WCS/25 is well suited to the diverse range of forms processing tasks required in the modern office environment. Its random access storage and powerful BASIC language processor equip it to quickly and conveniently handle the day-to-day operations of many small businesses and the departments and field operations of many larger businesses.

The WCS/25 is a powerful, low-cost, diskette based, multiterminal computer system. It features a 24K Central Processing Unit including a "hardwired" Extended BASIC language interpreter, 24K bytes of user memory, dual diskette drives for mass storage, and a 120 character-per-second printer — all in two coordinated pieces of office furniture. Additionally the WCS/25 includes a terminal controller and three Interactive Terminals, each comprised of a 1920 character CRT and typewriter style keyboard with numeric pad. The basic system may be expanded to include additional memory (up to 32K), an additional terminal and diskette drive, larger capacity cartridge disks, telecommunications capabilities, and a broad range of printers and plotters.

ELECTRONIC FORMS PROCESSING

Electronic Forms Processing involves primarily clerical level information gathering in response to promoted displays. When all information is assembled, it is printed in proper locations on required forms. Hundreds of examples of forms processing exist, including consumer finance contract preparation, insurance forms processing, mortgage closing management, tax preparation, personnel record keeping, order entry, invoicing and client billing. Once information has been captured on diskette, the WCS/25 may sort it, list it, or perform other processing tasks specific to the user's application.

DISTRIBUTED DATA PROCESSING

The WCS/25 is also well suited to various data entry and transaction processing tasks within larger organizations which have adopted a distributed processing approach. The system can provide for high volume multistation data entry through the use of Wang's convenient multi-terminal forms-building and data entry software. The diskette storage of the WCS/25 is generally well-matched to this environment, while the fast 120 CPS system printer is suitable for common departmental transaction tasks such

as invoicing, local sales analysis, and demand report generation. With the optional Model 2228B Communications Controller, several popular IBM binary synchronous protocols can be conveniently employed for high speed communication to a host computer.

The nucleus of the WCS/25 is a Central Processing Unit containing 24,576 (24K) bytes of Random Access Memory (RAM) expandable in an 8K module to a maximum of 32K bytes. A powerful 42.5K BASIC Interpreter is resident in a separate Read Only Memory area of the CPU. By "hardwiring" the interpreter, the necessity and time of 'paging' the system in and out of user memory is eliminated. Only 700 bytes of the user area are allocated for system use. In this way, WCS/25 compares favorably to a large computer with a much greater memory.

STORAGE

Completing the WCS/25 System are two diskette drives providing over one-half megabyte of high-speed, direct-access on-line storage. The use of removable diskettes provides off-line program and data storage capacity limited only by the number of diskettes one has on hand.

Physical Characteristics

Each WCS/25 diskette drive contains an easily replaceable Diskette Platter, about 7½ inches in diameter. Only one surface of the platter is used for recording data. The recording surface is divided into 64 concentric circular tracks; each track is segmented into 16 sectors. The recording surface thus contains a total of 1,024 sectors, numbered sequentially from 0 to 1,023. Each sector can store 256 bytes of information.

Storage Capacity

Each diskette can store 262,144 bytes of information (1,024 sectors x 256 bytes per sector) giving a system total of 524,288 bytes. A third drive is optionally available for a total of 786,432 bytes of storage.

Speed

Information is transferred to and from the diskette at high speed. The total time required to read or write an item of data on a diskette can be broken down into two components — the track access time and the disk latency time.

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Track Access Time — is the time required to position the read/write head to a specified track on the diskette platter. The “average access time” is the time required for the read/write head to move from track #0 to the middle track on a diskette platter. For the WCS/25 diskette, the average access time is 401 ms (about 0.4 second). If information is written or read sequentially on a platter, access time is minimized.

Disk Latency Time — is the time required for the desired sector on a track to rotate to the read/write head. The “average latency time” is the time required for a sector which is one-half track (eight sectors) away from the read/write head to rotate to the read/write head. Since the platter makes one complete revolution in 160 ms, the average latency time is one-half this time, or 80 ms (0.08 second). The staggered arrangement of sequential sectors on a track (which is transparent to the user software) makes it possible to read or write multi-sector records with significant savings in total latency time.

File Maintenance

Files can be maintained on disk in one (or both) of two modes: Automatic File Cataloging mode and Absolute Sector Addressing mode. The BASIC commands and statements in both modes are built into the Wang WCS/25.

Automatic File Cataloging — includes several BASIC statements and commands which constitute an internal data management system. Catalog mode permits the user to save and load programs or data files by name, without concern for where or how the files are actually stored on disk or the actual sector address of the data. (This information is recorded in a special “catalog index” which is automatically maintained by the system itself.)

Absolute Sector Addressing — includes a number of BASIC statements which permit the programmer to address specific sectors on disk, thus enabling him to design his own data management system. Two Absolute Sector mode statements are provided which make possible the saving and loading of unformatted data. This enables the programmer to include his own control information in individual records.

Reliability

Although the Diskette Unit is an extremely reliable device, both cyclic redundancy (CRC) and logical

redundancy (LRC) checksum tests are made automatically on all data read from the diskette. If a CRC error is detected in a sector, that sector is automatically reread four times before an error is signalled. An additional read-after-write verification test can be optionally specified by the programmer simply by including a single parameter in the appropriate BASIC statement or command.

PRINTER

The Wang Model 2231W-2 Line Printer provides complete, high-speed alphanumeric printing capability to the Wang WCS/25. The printer prints characters composed of a 7 by 9 dot matrix at a rate of approximately 120 characters per second, with limits between 45 and 250 lines per minute, depending upon line length (i.e., 45 LPM for a 132-character line and approximately 250 LPM for a 10-character line). Maximum line length is 132 characters. The Model 2231W-2 printer is capable of printing out a fully-formatted alphabetic and numeric character set under program control. The printer has a 96 character set including uppercase and lowercase letters.

Since the Model 2231W-2 printer uses a matrix impact printing technique, as many as four carbon copies can be generated simultaneously with the original. Proper registration of printed material on all copies is guaranteed by a pin-feed platen, the width of which is continuously adjustable from 3.5 to 13.5 inches (8.9 to 34.3 cm). Paper is automatically advanced from one line to the next by a punched paper tape loop. Other printers, with speeds ranging from 15 CPS to 600 LPM, are optionally available.

TERMINALS

The WCS/25 includes a Multiplex Controller, three Interactive Terminals and supporting utility software.

Terminal Multiplex Controller

A microprocessor-driven Terminal Multiplex Controller supports up to four interactive terminals, and occupies only a single I/O port in the CPU. The controller includes complete communications electronics, as well as separate input and output buffers for each terminal. Because all multiplex electronics are contained on the controller board, neither a separate chassis nor a power supply is required.

The microprocessor coordinates data transfer between the CPU, the Multiplex Controller I/O buffers,

WCS/25

Interactive
Terminals

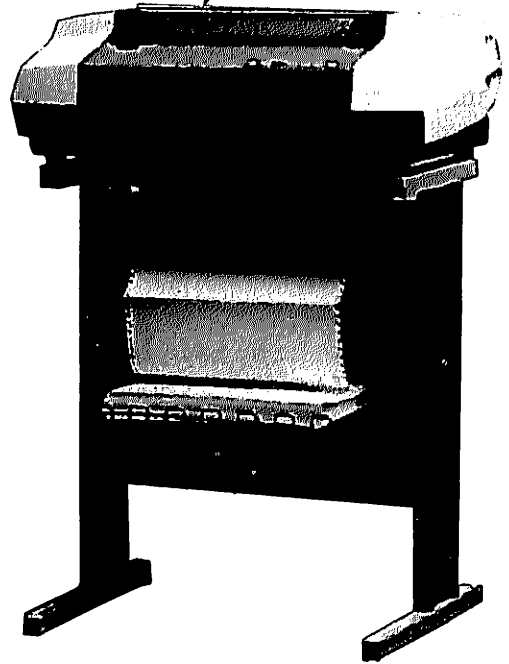
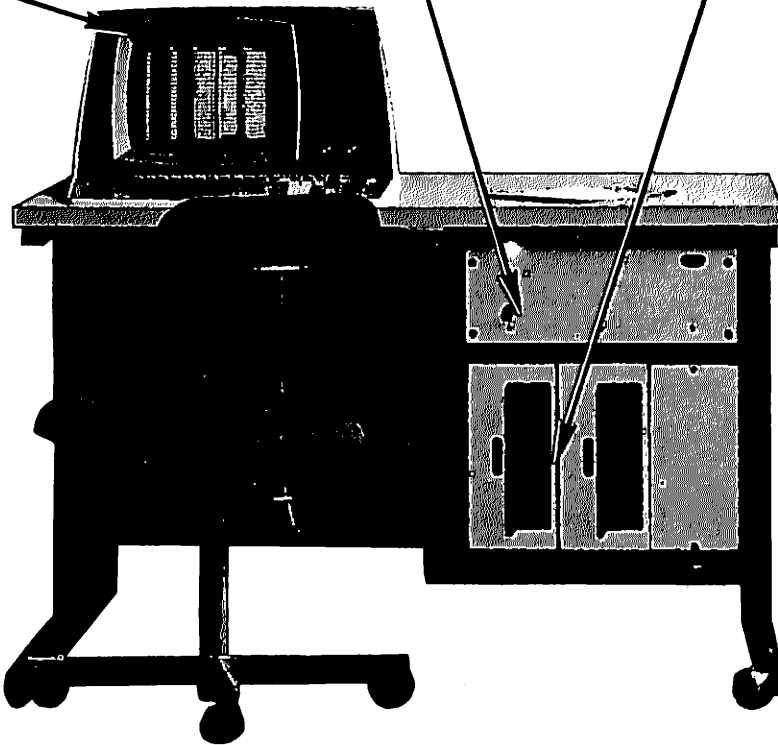


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CPU conveniently
contained in the
table housing

Dual Diskette
Drive

120 CPS
Matrix Printer



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and each terminal; therefore, it permits overlapped processing by leaving the CPU free to perform other tasks, such as range checks, while it handles full-duplex asynchronous communication with all 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 a 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.

Interactive Terminals

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 (30.4 cm) diagonally and displays 1920 character positions. The display and keyboard support both upper and lowercase alphabetic characters. 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. Formatted display 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.

When running application programs, all three terminals function identically as interactive data entry terminals. In addition, one of the terminals has a special status as an operator's console for operations which involve direct communication with the system (such as system initialization, program loading, and reception of system error messages etc.).

A programmable audio alarm is provided to gain the operator's attention when special conditions occur.

Brightness and contrast controls provide a sharp, clear image on the screen. Display speed is 9600 bps, which allows the entire screen to be filled almost instantaneously. Any standard Wang printer, provided for by each terminal's 256-byte print buffer in the Multiplex Controller, may be plugged into an Interactive Terminal.

Line handling between each Interactive Terminal is asynchronous full-duplex at up to 9600 baud. Each Interactive Terminal can be situated in a direct local up to 1000 ft., extended local through 'short haul' modems, or remote environment through compatible modems relative to the CPU. In all cases, the four plugs at the Multiplex Controller and the plug at the Interactive Terminal are 25-pin, RS-232-C compatible.

SOFTWARE

Software currently available in the 2200 Series products is also compatible with WCS/25 making available a vast library of programs that fit nearly every commercial and technical application.

WCS/25 INSTRUCTION SET

The extensive commercial instruction set of the WCS/25 is identical to that provided by Wang's 42.5K BASIC language ROM in the large disk-based WCS/30. In particular, the WCS/25 offers a powerful set of sort instructions which support a high-speed, built-in sorting capability.

User Defined Special Function Keys

All 32 Special Function Key operations can be defined by the user and instantly redefined to meet changing requirements. The keys can be used to access, with a single keystroke, commonly used character strings for text entry, or they can provide program entry points directly from the keyboard.

WCS/25 Keyboard Operations

The keyboard has two modes of operation: A/A and A/a. The A/A mode forces all alphabetic characters to uppercase — a useful feature for program entry and many data entry applications. A/a mode functions as a standard typewriter providing upper and lowercase alpha characters.

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Character EDIT Mode

The Character EDIT Mode is designed to facilitate editing of lines of program text recalled from memory or data being input and displayed on the CRT: ←←←(Multispace left), ← (Space left), → (Space right), →→→ (Multispace right), INSERT, DELETE, ERASE, and RECALL.

The EDIT key is used to enter EDIT mode. The RECALL key is used to recall a program line previously entered into memory. The Multispace (left and right) keys are provided to move the cursor five spaces to the left or right. The two Space keys are provided to move the cursor a single space to the left or right. The INSERT key is used to expand a line to allow for additional text or data. When the DELETE key is depressed, the character at the current cursor position is deleted. A program or data line can be erased from the current cursor position to the end of the line by touching the ERASE key.

SPECIFICATIONS

WCS/25 Central Processing Unit

Memory Size: 24K, 32K

WCS/25 Diskette Storage Capacity

Platters 2
Sectors per Platter/Total Sectors 1,024
Bytes per Platter 262,144
Total Bytes 524,288
(Up to three drives with a total of 786,432 bytes storage)

Performance

Rotation Speed 375 RPM

Access Time (Position Head to Track)

Minimum (one track) 15 ms
Average (across one-half available tracks) 401 ms
Maximum (across all available tracks) 803 ms

Latency Time (Platter Rotation to Sector on Track)

Average (one sector read/write one-half revolution) 80 ms
Additional sectors in the same revolution 40 ms

Read/Write Time

One 256 byte sector (including CPU/controller overhead) 21.8 ms

MOVE/COPY Time (Entire Diskette Platter)

Approx 2 min

Size of WCS/25 Console & CPU & Storage

Height 40 in. (101.6 cm)
Depth 30 in. (76.2 cm)
Width 46 in. (176.84 cm)
Weight 189 lb (85.6 kg) (approx)

Power Requirements

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

Fuses

Cabinet: 10A @ 115V and 230V
CPU: 3A SB @ 115V
1.5A SB @ 230V
Diskette: 4A @ 115V and 230V
CRT/Keyboard: 1.5A @ 115V
1A @ 230V

Operating Environment

50°F to 90°F (10°C to 32°C)
20% to 80% Relative Humidity
Recommended Relative Humidity 35% to 65%

Interactive Terminal

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
255 Watts

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SPECIFICATIONS (Cont.)

Fuses

2.5A @ 115V/60 Hz
1.2A @ 230V/50 Hz

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 length of 25 ft (7.6m) direct connection cable is supplied with each Model 2236. Optional direct connection cables are available in 100 ft (30.5m) increments up to 1,000 ft (304.8m). Optional modem connection cables are available in lengths of 12 ft (3.7m), 25 ft (7.6m), and 50 ft (15.2m) for both the 2236 terminals and multiplexer controller.

ORDERING SPECIFICATIONS

A Keyboard Programmable Central Processing Unit (CPU) with 42.5K hardwired BASIC language in ROM. The CPU must have at least 24,576 bytes of RAM memory, expandable in an 8,192 byte increment to 32,768 bytes. An EDIT feature must be hardwired into the system. The CPU must be capable of supporting a 132-column (120 CPS) High Speed Printer.

The three Interactive Terminals must each consist of an integrated Cathode Ray Tube (CRT) and an upper/lowercase keyboard with numeric keypad. The CRT must be a 12-inch diagonal screen capable of displaying 24 lines, each 80 characters in length. Sixteen Special Function keys and one general-purpose function key must be under program control and easily accessed from the keyboard. Upper and lowercase alphabetic and special characters must be capable of being keyed and displayed on the terminal.

The Multiplex Controller must be available to support four terminals and must provide local direct wire connection at communication speeds of up to 9600 baud. It must contain a microprocessor and communication electronics, as well as the following for each possible terminal: one 256-byte input buffer, a separate output buffer for display purposes, and one 256-byte output buffer for printer purposes. For non-clocked modem use, it must provide speeds at either 300, 600, 1200, 2400, or 4800 baud, and 9600 baud. Communication must be asynchronous, full-duplex in either Wang or Teletype compatible formats. BASIC

Language subroutines must be supplied to facilitate display controls, polling functions, and handled data transfer functions. This software must contain a cursor positioning subroutine for use in the Wang asynchronous mode.

Options available must include cable connection up to 1,000 ft between CPU and terminal as well as optional printers which can be attached directly to the terminals themselves.

Two removable diskette drives capable of storing programs and data for the Wang Computer System/25. The diskette drives must provide a storage capacity of at least 262,144 bytes each. Diskette platters must be easily inserted in and removed from the unit; individual platters must be formatted automatically by the unit. The System must provide the capability to read and write multi-sector records of variable length, and to use entire arrays as arguments. The system also must provide a hard-wired internal data management system, as well as a number of BASIC statements and commands which permit the programmer to design his own disk management system. Finally, the system must provide a rapid platter-to-platter backup capability for at least two of the three diskette drives in the diskette unit. All of these features, as well as all interface and control electronics, must be included in the price quoted for the diskette drive; none should be considered optional extras. Also must drive a Model 2292 CRT Auxiliary Display.

Maintenance Contract Available.

Standard Warranty Applies

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



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