

WANG

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DATA SHEET

The Wang PCS-II has been specially designed as a compact, quick-access desktop computer powerful enough to meet the specialized demands of engineers, laboratory technicians, and scientists — yet flexible enough to meet the data processing needs of students, accountants, businessmen and administrators. With its standard minidiskette drive, the PCS-II offers for the first time the power and flexibility of rapid random access data and program storage at the price of a low cost personal computer. The standard unit contains a large video display screen with upper/lowercase capability, a versatile upper/lowercase alphanumeric/BASIC Keyword keyboard and a single minidiskette drive, all compactly housed together with the central processor in an attractive desk-top console.

The central processor contains 8K bytes of random access memory (RAM) accessible to the user and 42.5K bytes of BASIC language interpreter 'hardwired' in Read Only Memory (ROM). Only 700 bytes of RAM are utilized for system 'housekeeping'.

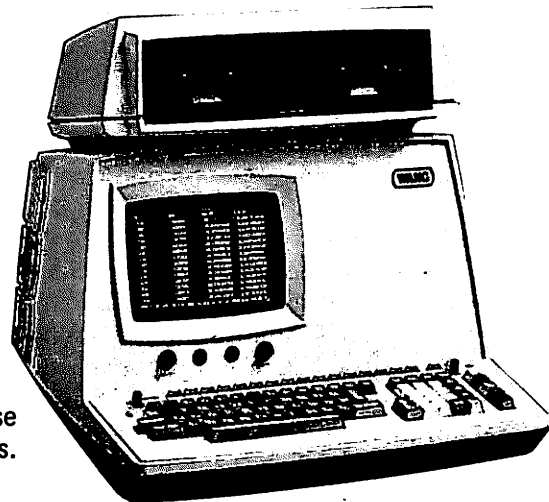
Several options are available to expand the standard unit for more specialized processing needs: user-accessible memory can be expanded to 16K, 24K, or 32K bytes; an additional minidiskette drive can be mounted in the unit; a number of printers and plotters can be attached; an auxiliary display can be attached; and additional program control facility can be obtained with a number of options:

- Option 60 — (Auxiliary Display Connector, Keyboard Clicker and Audio Alarm)
- Option 60A — 80X24 Character CRT with Option 60
- Option 61 — Output Writer (156 column, 15 CPS with controller)*
- Option 62 — Buffered Asynchronous Communications Controller*
- Option 62B — Communications Controller*
- Option 65 — IEEE — 488 Standard Interface*
- Option 67 — I/O Interface Controller (8-bit parallel)*

*mutually exclusive

THE PCS-II CONCEPT

The new PCS-II contains a Wang compatible high speed interpretive BASIC CPU, a full-function keyboard/CRT executive console and optionally supports a wide array of standard Wang peripheral devices. When these components are combined with the Wang-developed minidiskette in an attractive self-contained desk-top console, the resulting computer system is an entirely new category of user-oriented/application-oriented device. Thus, the PCS-II cost effectively combines several necessary features of larger computers with an operational ease so that it can be fully employed by non-EDP users.



PCS-II

Among the qualities of larger computers which have been transferred to the PSC-II several stand out:

- Powerful CPU with expandable memory and commercial, high-level language instruction set
- Random ACCESS Disk file storage with automatic file catalog management
- Broad range of auxiliary Printers, Communications and other application-oriented computer peripherals

Several features which make the PCS-II usable by everyone are notable:

- A simple English-like BASIC language interpreter with extensive interactive editing
- A use-oriented console with single-key BASIC, application function keys and the fastest display on any computer
- Dual memories which power-on ready for instant use and provide the user with a separate, protected memory for applications.

Through the combination of all these features and many more, the Wang PCS-II offers the only affordable, full function computer system ideally suited to personal or management use in an unlimited array of today's small computing applications.

THE PSC-II IN ACTION

The Wang PCS-II can be successfully applied to many current small scale computing applications — and may also be commonly applied to the automation of tasks which were formerly done manually. Most computer applications are primarily file-oriented, and the same is true for smaller scale personal and management level applications. For this key reason the Wang PCS-II was specifically designed for fast, efficient and convenient file management. Its unique minidiskette features the only low cost storage technology which offers fast random access for instant retrieval, display, listing, sorting, comparing, merging, editing and overall management of critical files for personal or business use.

THE PCS-II AS AN INTELLIGENT TERMINAL

When equipped with the Option 62B Communications Controller, the PCS-II is transformed into a super-intelligent terminal which provides the ease and low cost of data entry equipment along with the power and functionality of a small business computer. The Communicating PSC-II is viewed as the first of a new generation of 'hybrid' systems: half intelligent terminal and half small business computer. It offers a totally new alternative to the current generation of intelligent data entry only terminals. A programmerless forms-building and data entry language, called EASYFORM, provides for the type of applications usually associated with intelligent terminals. While the PSC-II's comprehensive business BASIC provides additional capabilities and allows data processing tasks to be quietly implemented on the same system.

The Option 62B Communications Controller on the PCS-II is a microprocessor-based device, distinct from the main processor and memory of the system. As an independent system resource the Communications Controller contains its own microprocessor with 1K ROM and 8K RAM, allowing it to fully implement several popular IBM binary synchronous protocols. The PCS-II with Option 62B can emulate with complete multi-record blocking, transparency and automatic retransmission the protocols of 2780, 3780 or 3741. The Communicating PCS-II is ideally suited to Distributed Data Processing applications with the emphasis on the Processing.

THE PCS-II IN DETAIL

The following description details the characteristics of the Wang PCS-II, all its system components and its BASIC language features and operations:

THE CENTRAL PROCESSOR

An 8192 byte RAM and printer/plotter/minidiskette I/O capabilities are standard features of the system. The 42.5K byte ROM contains over one hundred Wang BASIC statements, commands and functions, ninety-nine 'hardwired' diagnostic error messages, and a standard edit capability instantly accessible at the touch of a key. Immediate mode calculations can be performed even during program execution by entering BASIC statements to perform one-line calculations. Multi-statement lines (up to 192 keystrokes long) can be used both in immediate and program mode. Up to 32 subroutines can be defined for single-keystroke access from the keyboard. Arithmetic operations are performed with 13-digit precision; trigonometric functions are normally evaluated to 12-digit precision.

Numeric values are stored internally within the range 10⁻⁹⁹ to 10⁹⁹.

The hardwired BASIC interpreter is immediately available once your system is on. Most BASIC keywords can be input with a single keystroke; once in memory each keyword is atomized and occupies only one byte.

Wang BASIC commands are non-programmable and provide quick access to and modification of programs stored in memory. A BASIC command provides the user with a means of direct communication with the system; BASIC commands are not part of programs but are keyed in directly on the keyboard to facilitate running a program. BASIC commands include CLEAR (to clear random-access memory), LIST (to list programs), HALT/STEP and CONTINUE (for external program control), RENUMBER (to renumber program lines), RESET (to return control to the console during program execution) and RUN (to execute programs).

Wang BASIC functions are fully programmable and permit manipulation of numeric and alphanumeric data.

In addition to the usual trigonometric and algebraic functions such as SIN, COS, TAN, ARCSIN, ARCCOS, ARCTAN, absolute value (ABS), determining the natural logarithm (LOG), exponentiation (EXP), taking square roots (SQR), obtaining a random value (RND), determining the sign (SGN) and integer value (INT) of an expression, providing the value of π (#PI) Wang BASIC provides a number of unique functions. These functions include FN, which is a user-defined function of a single variable; HEX which permits 8-bit alphanumeric control codes to be programmed; LEN, which establishes how many bytes are in a specified alphanumeric variable; NUM, which counts the ASCII characters in an alpha variable; POS, which finds the location of a specified character; STR, which extracts a substring of an alpha variable;

TAB, which prepares tabulated formats; and VAL, which converts an ASCII character to a decimal integer.

Wang BASIC statements are used to construct the programs that will run on your unit. They fall into five categories: fundamental statements, math matrix statements, alphanumeric sort statements, advanced I/O statements and peripheral statements.

FUNDAMENTAL STATEMENTS

These statements are used in forming the programs to run on your machine. Although these statements are fundamental to Wang BASIC, they provide a power and versatility to your programming which cannot be found in other forms of BASIC. For example, the PRINTUSING statement with its % (image) statement permits concise formatting of printed reports to output leading dollar signs (\$), commas, and insert printed decimal points. COM, DIM and COM CLEAR statements maximize the use of memory for variable storage, permitting the passage of variables between program 'pages' which are overlaid in memory. GOSUB permits passing arguments to subroutines; KEYIN and INPUT permit customization of keyboard data input routines; DEFFN, DEFFN', DEFFN' HEX, GOSUB, RETURN and RETURN CLEAR are all essential for the execution of subroutines and specialized branching. Many unique and powerful bit-and-byte manipulation statements such as BIN and BOOL permit binary manipulation, binary arithmetic and use logical operands.

AND, OR and XOR perform logical operations on specified arguments; INIT sets every byte in an argument to a specified value; while ROTATE rotates the bits of a given byte.

FOR, NEXT and GO TO statements permit simple program branching to be effected. More sophisticated branching can be obtained by using the IF, ON, and ON ERROR statements. PACK and UNPACK are used to maximize the storage of numeric arrays. Binary addition is provided with the ADD statement, while the hexadecimal equivalent of any alpha value can be obtained with HEXPRINT. Data stored within program text can be read with the READ, DATA and RESTORE statements in addition to the availability of the usual LET assignment statement. CONVERT can convert a numeric to an alpha value or vice versa. Program control can be effected with the STOP statement, and the programmer can optionally TRACE through all program branches, determine program size (with the END statement), provide internal documentation with the REM (remark) statement, or govern output with the SELECT and PRINT statements.

Math Matrix statements permit the manipulation of entire arrays, perform the basic mathematical matrix calculations according to the rules of linear algebra (addition (MAT+), subtraction (MAT-), multiplication (MAT*), scalar multiplication (MATK*), inversion (MAT INV), transposition (MAT TRN) and set up conditioned (MAT CON), identity (MAT IDN) and zero matrices (MAT ZER) as needed. Where

necessary, arrays can be automatically redimensioned or redimensioned explicitly (MAT REDIM). These MAT statements also perform matrix input/output operations on complete numeric and alphanumeric arrays (with MAT INPUT, MAT READ and MAT PRINT) and two arrays can be set equal to each other (with MAT=).

SORT STATEMENTS

These statements provide rapid access to alphanumeric arrays and permit swift text editing, sorting, searching and moving of data. Data can be moved from one area of memory to another, sorted in a specified manner or searched for particular combinations of characters. The MAT SORT statement utilizes a pointer array to establish the location of each data element being sorted rather than performing a physical sort. This approach maximizes storage capabilities and minimizes access time. MAT CONVERT converts numeric to alpha data and puts converted values into sort format before sorting. MAT COPY and MAT MOVE transfer data between arrays, MAT MERGE performs part of the sort/merge operation, while MAT SEARCH scans an array for specified character substrings.

ADVANCED I/O STATEMENTS

These statements, also called General I/O Statements, permit the ultimate I/O programmability within a BASIC Program. One statement (\$GIO) uses a machine-language technique to custom-tailor I/O operating sequences; the others are used to test data- and device-ready conditions, pack, unpack and transfer data. \$GIO is used to custom-tailor I/O operations; \$PACK packs any form of data for optimum storage; \$IFON tests data-ready or device-ready condition of device; \$UNPACK unpacks packed data; while \$TRAN provides character-code conversion via high-speed table look-ups.

PERIPHERAL STATEMENTS

Many versatile Wang peripherals can be operated directly with the numerous BASIC statements available on your system.

Minidiskette commands and statements permit flexible and versatile use of your minidiskette unit.

COPY	Copies sectors from one platter to another.
DATALOAD BA	Reads a sector.
DATALOAD DA	Reads a logical record.
DATALOAD DC	Reads a catalogued record.
DATALOAD DC OPEN	Opens a catalogued file.
DATASAVE BA	Writes a sector.
DATASAVE DA	Writes a logical record.
DATASAVE DC	Writes a record.
LOAD DA	Loads and executes a program (statement).
SAVE DA	Saves program on platter by sector.
SAVE DC	Saves and catalogs all or part of a program on a platter.

DATASAVE DC CLOSE	Closes a catalogued file.
DATASAVE DC OPEN	Opens a catalogued data file.
D BACKSPACE	Backspaces.
DSKIP	Skips logical records.
IF END THEN	Conditional branch on end-of file.
LIMITS	Obtains file limits.
LIST DC	Lists the contents of the catalog index.
LOAD DA	Loads and executes program.
LOAD DC	Loads a catalogued program file.
MOVE	Compresses and moves catalog to another platter.
MOVE END	Moves the end of a catalog area.
SCRATCH	Changes file status from active to 'scratched'.
SCRATCH DISK	Reserves space for catalog and index.
VERIFY	Verifies data recorded on platter.

PLOTTER STATEMENT

PLOT moves plotting carrier (pen, ball or ballpoint pen) the specified number of increments in the specified direction. Options are available for pen movement with pen up, pen down, setting spaces, setting character size and plotting alphanumeric strings.

VARIABLES

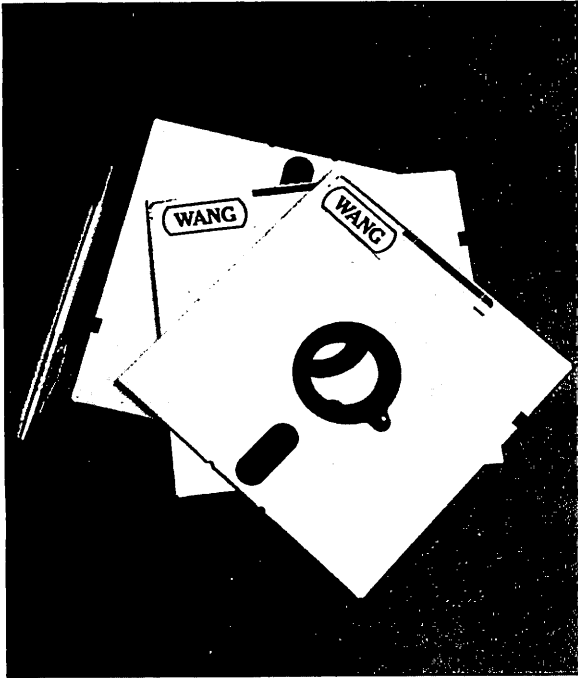
Up to 286 variable names can be used for: simple numeric variables, numeric arrays, alphanumeric variables, alphanumeric arrays. This permits a total of 1,144 unique variable names. Arrays can be one- or two-dimensional; either dimension can have a maximum of 255 elements. An alphanumeric variable can be up to 64 bytes (characters) long.

THE CRT

The bright video display screen or CRT (cathode ray tube) permits quick display of any programs or data stored in memory. Lines can be up to 64 characters long; up to 16 lines can be displayed at one time on the screen. New lines appear on the screen beneath the previous lines; once the screen has been filled, the top line disappears and all others move up to allow room at the bottom of the screen for current characters. Two controls permit adjustment of the brightness and contrast of the screen display. The Edit Mode of operation permits editing of programs and data directly on the screen. Editing is quick and available at the touch of a single key; in edit mode a single line can be recalled from memory instantly. This eliminates stepping through an entire program to make a single change.

THE MINIDISKETTE UNIT

The minidiskette unit provides the system with compact and efficient disk-storage capability. Minidiskettes are small, no more than 5¼ inches (13.4 cm) in diameter, but can contain up to 89,000 bytes of programs or data; information is stored in 350 sectors on the diskette. With Wang BASIC's Pack and Unpack facility, an optimum amount of data can be stored on these minidiskettes. The minidiskette is completely software compatible with Wang's System 2200 and WCS disk/diskette product line.



THE KEYBOARD

The keyboard of the compact, desk-top computer combines the best features of a typewriter keyboard and an accounting machine numeric pad. The mathematical function and numeric operator keys are grouped with the numeric keys for quick access. The

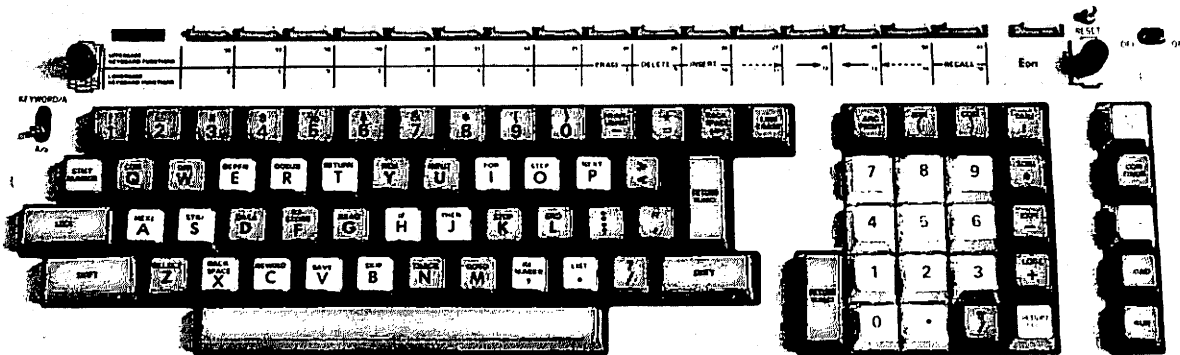
typewriter keyboard has both upper and lowercase capability and contains a full complement of BASIC keywords. To input BASIC words with a single key-stroke, the keyboard is placed in Keyword/A mode (the shift key is pressed for upper case characters). For upper and lowercase input, the keyboard is placed in A/a mode. (Mode is selected with the toggle switch at the left of the keyboard.)

At the far right of the keyboard a set of program control keys is situated. It contains keys such as Reset, HALT/STEP, CONTINUE, LOAD, CLEAR, and RUN. Above these keys is the processing lamp; when this lamp is on, processing is going on in the central processor.

At the top of the keyboard are a set of function keys used to access up to 32 user-defined functions or subroutines. Nine of these keys also do double-duty as Edit keys when the system is in Edit mode. When the Edit key is pressed, the system is in Edit Mode, and an asterisk appears at the beginning of any line being edited. In Edit Mode, the Edit/function keys are used to move the cursor about the screen and make alterations in text displayed on the screen.

SPECIAL FEATURES OF THE PCS-II

- Immediate Mode — In this mode the user may enter unnumbered BASIC statement lines for immediate execution. This may be done without altering programs currently in memory and makes possible the interrogation of dynamic variables even while a program is running.
- Programming Mode — In this mode, program lines are numbered and stored in memory for later execution. Multi-statement lines up to 192 key-strokes long can be used and 32 user-defined key accessible functions can be defined. A label strip for customized use of the keyboard's function keys provides easy direction for the user. The END statement can be used to establish how much memory is unused; it can be executed in the immediate mode or within a program.



- Editing and Debugging — A set of sophisticated program debugging tools is provided on the PCS-II. TRACE mode steps through an entire program indicating any variable changes, where transfers to statements or subroutines occur and values of loop counters. The HALT/STEP key allows the programmer to halt execution of a program and step through it one statement at a time. The ON ERROR GO TO statement permits a program to control execution in the event of a program or data error. The RENUMBER command permits automatic renumbering of an entire program, or specified portions of it, with suitable increments. Edit keys and Edit mode permit quick and discrete editing of individual program lines. It is never necessary to reenter an entire program line when it needs to be changed. Edit mode gives the user the facility to recall an individual program line from memory, change, replace or add any characters from the line and reenter it automatically into its appropriate location in memory. Edit mode operations take place at the touch of a key and greatly facilitate programming debugging and data input on the PCS-II.

- Plotters can be added:
 - Model 2272 Digital Drum Plotters (single or triple pen, with point, line and alphanumeric plotting capabilities to an accuracy of 0.01 in. plus 0.1%/in. (0.0254 cm plus 0.1%/cm) with plot up to 16 in. (41 cm) wide by any length).
- The Auxiliary Display can be added:
 - Model 2292 Auxiliary Display (12 in. (30.5 cm) diagonal) 'slave' CRT can be 'daisy chained' up to a maximum of 500 feet (152.4 m) from the controller. Option 60 is required for plug-in capability.
- Special Options are available:
 - Option 60 — Keyboard Clicker, Audio Alarm and Auxiliary Display Connector.
 - Option 60A — 80X24 Character CRT with Option 60.
 - Option 61 — Output Writer (156 column, 15 cps with controller).*
 - Option 62 — Buffered Asynchronous Communications Controller.*
 - Option 62B — Communications Controller.*
 - Option 65 — IEEE-488 Standard Interface.*
 - Option 67 — I/O Interface Controller (8-bit parallel).*

*mutually exclusive

ADD-ONS

- Memory can be expanded in 8,192 byte increments to 32,768 bytes.
- A second minidiskette drive can be part of the unit.
- An 80X24 character CRT can be part of the unit.
- Printers of various sizes and speeds can be added:
 - Model 2221W Line Printer (132 columns, 200 cps, 7 x 9 dot matrix character printer, 96-character set with upper/lowercase and expanded print capability).
 - Model 2231W or 2231W-2 Line Printer (112 or 132 columns, 120 cps, 7 x 9 dot matrix character printer, 96-character set with upper/lowercase and expanded print capability).
 - Model 2251 Line Printer (40 columns, up to 90 lines/minute, compact, 96-character set with upper/lowercase capability, 7 x 8 dot matrix is fully programmable red or blue on continuous roll paper, with automatic indenting of program lists).
 - Model 2261W Line Printer (132 column, up to 125 lpm, bidirectional).
 - Model 2263-1 or 2263-2 Printer (132 column, 400 to 600 lpm).
 - Model 2271 Impact Character Printer (132 or 156 columns, 10 or 12 pitch, 17 cps, bidirectional, 96-character set with upper/lowercase capability).
 - Model 2281 Line Printer (132 or 158 column, 40 cps, bidirectional daisy wheel printer with a 10 or 12 pitch, 96-character set with upper/lowercase capability).

SPECIFICATIONS

Unit Size

Height 18 3/4 in. (47.7 cm)
 Depth 20 1/2 in. (52 cm)
 Width 19 3/4 in. (50.2 cm)

Approximate Net Weight

62 lb (30 kg)

Display

Approx. Size 9 in. (22.9 cm) diagonal
 Capacity 16 lines, 64 char/line
 Character Size
 (height and width) 0.125 in. (.32 cm)

Keyboard

Upper/lowercase alphanumeric/BASIC keyword with full typewriter, full numeric pad, mathematical function keys, arithmetic operators, special function keys and edit keys.

Minidiskette Drive

Sectors 350
 Tracks 35
 Bytes 89,600
 Sectors/Track 10
 Bytes/Sector 256
 Average Access Time 533 ms
 Speed 300 rpm
 Transfer Rate 125 kilobits/sec

Minidiskette

5 1/4 in. (13.3 cm) diameter with write protect notch

Peripheral Capacity

Two connector jacks for printers and plotters, one for TC option and one spare

Central Processor

Random Access Memory (RAM) Size 8K
 Largest Line Number 9999
 Magnitude of Numbers 10⁻⁹⁹ to 10⁹⁹
 Precision 13 significant digits
 Variables

Type numeric, numeric array,
 alphanumeric, alphanumeric array

Variable Names . . . 286 each type; 1,144 total
 Arrays one or two dimensional,
 both numeric and alphanumeric

Maximum size of alphanumeric variable 64 characters

Maximum Nesting

FOR-NEXT loops 45 levels
 Subroutines 45 levels

Storage Code

ASCII

Size of Byte

8 bits

Type of Arithmetic

Decimal

System Language

Name Wang Extended BASIC
 Commands 13
 Statements 110
 Functions 22
 Error Codes 99

Operating Environment

50° to 90°F (10° to 32°C)
 40% to 60% relative humidity, recommended
 30% to 70% relative humidity, allowable
 dedicated power line

Power Requirements

115 or 230 VAC ± 10%
 50 or 60 Hz ± 1 Hz
 415W

Fuses

4ASB @ 115V/60 Hz
 2ASB @ 230V/50 Hz

Cable

8 ft (2.4m) cord with 3-prong plug to power source

Standard Warranty Applies

ORDERING SPECIFICATIONS

The completely self-contained PCS-II must contain a keyboard programmable Central Processor, an upper/lowercase 9-inch diagonal Video Display, a Single Minidiskette Drive and an Upper/Lowercase Alphanumeric/BASIC Keyword Keyboard.

The central processor must contain the Wang Extended BASIC language interpreter in Read Only Memory and have at least 8,192 bytes of Random Access Memory expandable in 8,192-byte modules to 32,768 bytes. Character Edit Mode, General I/O Instruction Set, SORT statements, Matrix Statements and Disk Commands and Statements must be standard features of the Wang BASIC language available in the unit. The video display unit must display at least 1,024 characters at a time (16 rows of 64 characters). The minidiskette unit must be able to drive a minidiskette capable of holding 89,600 bytes of data in 350 sectors; diskettes should not be more than 5 1/4 inches in diameter. The keyboard must contain a full typewriter keyboard, a numeric pad (numbers 0 to 9), a set of program control keys and 16 Special Function Keys to access 32 user-defined functions. The keyboard must also have upper-lowercase capability and contain 34 BASIC keywords to input BASIC commands and statements with a single keystroke.

The following options and peripherals must be fully compatible with this unit: Model 2221W Line Printer; Model 2231W and 2231W-2 Line Printers; Model 2251 Line Printer; Model 2261W Line Printer; Model 2263-1 and 2263-2 Line Printer; Model 2271 Bidirectional Printer; Model 2281 Line Printer; Model 2272-1, -2 Digital Drum Plotters; Model 2272M-1, -2 Digital Drum Plotters; Option 60 Auxiliary Display Connector, Audio Alarm and Keyboard Clicker; Option 61 Output Writer; Option 62 Buffered Asynchronous Communications Controller; Option 62B Communications Controller; Option 65 IEEE-488 Standard Interface; Option 60A 80X24 CRT with Option 60; Option 67 I/O Interface Controller (8-bit parallel).

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Printed in U.S.A.
700-4153
2-77-25M