MODEL TEN
COMPUTER SYSTEM

GENERAL DESCRIPTION
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REVISIONS

Revision	Date	Approval	Description
X0	5/75		Preliminary edition.
X1	10/75		Release edition.

CONTENTS

This manual is intended to provide the reader with a general introduction to the Model Ten Computer System. The term Model Ten Computer System is used to designate a minicomputer family of products.

This General Description manual includes a brief introduction to the company, its products and options, and the support provided for its customers. Please contact your nearest DATA 100 OEM salesman for additional information.

1.1   WHO IS CAL DATA

California Data Processors (Cal Data) is a wholly-owned subsidiary of DATA 100 Corporation, the world's largest independent manufacturer of remote batch terminal systems.

DATA 100 employees now number in excess of 2,500 in manufacturing, sales and service facilities in North America, Europe and Australia. Corporate-wide sales since 1969 have grown to over $100 million annually, primarily in minicomputer-based systems.

1970 saw the introduction of the industry's first successful mini-computer based terminal system. An aggressive program of constant product improvement and expansion led to the introduction of the Cal Data 1 minicomputer in 1974.

The CD 135 minicomputer serves as the basic component of the Model Ten Computer System. In this system, DATA 100 has backed up the computer with a wide range of peripherals and options, plus the DATA 100 world-wide Field Engineering organization, numbering over 400 personnel.

DATA 100 Corporation and its subsidiaries include:

Cal Data	Minicomputers, computer memories, accessories
ODEC	Line printers
Iomec	Disk drives, magnetic tape, cartridge tape
Digitronics	Paper tape
DATA 100	Card readers, CRTs, communications products

SECTION 2
SYSTEM DESCRIPTION

2.1   GENERAL

The Model Ten Computer System is a low-cost, high-performance minicomputer system developed to meet the needs of today's user with a powerful flexibility unavailable in other systems.

The Model Ten Computer System flexibility is a result of:

Microprogramming Capability

By modifying the high-speed microcommand control memory, additional instructions can be added, or the entire operation of the system can be altered.

Superior Design

The CD 135 Computer offers improved throughput, greater packaging density, lower bus load and power demand, and more capacity than the emulated minicomputer.

This versatility, combined with reliability and a full range of field-proven peripherals, is part of every Model Ten Computer System.

3.1 COMPUTER

The CD 135 Computer is the basic controller in a Model Ten Computer System. It is a high-speed, microprogrammed digital computer.

The CD 135 Computer operates on firmware (microprogram sequences) stored in a control memory. The control memory acts like a computer within a computer, but at five times the speed of the main computer. By changing the contents of control memory, the entire operation of the computer can be altered or additional instructions can be added.

Contained within a standard 10.5-inch rack-mountable chassis are the computer, memory, power supplies, cooling fans, control panels and peripheral interfaces.

The Model Ten Computer System supports up to 128K words (256K bytes) of memory with cycles times of 675 ns or 850 ns. Provisions are included for attaching various peripherals, additional magnetic memory and an expansion chassis for additional I/O devices.

Peripheral equipment is attached to the system via the bidirectional MACROBUS. The MACROBUS is time-shared by all elements of the system, including the basic computer. Devices on the MACROBUS can communicate directly with other devices, independently of the computer.

The basic system consists of the CD 135 Computer with:

    a. 8K words of 675-ns core memory, or

    b. 16K words of 850-ns core memory, or

    c. Two 8K-word interleaved core memory of 425-ns, or

    d. Two 16K-word interleaved core memory of 450-ns

Each of these configurations may be expanded to 128K words of memory.

The computer consists of three functional elements: control section, data section and I/O section. The control and data sections (referred to as the Engine) contain the internal arithmetic/logic circuits, data paths, processor registers, control memory and timing circuitry of the machine. The I/O section contains the basic MACROBUS data, address and control circuitry for all parallel I/O operations in the system. An optional serial I/O communication channel for teleprinter or other serial devices can be attached to the MACROBUS.

Line-Frequency Clock and power-failure/restart circuits are included with the computer as standard items. The contents of memory are saved in the event of a power failure.

A Macropanel, representing the control panel of a general-purpose computer, is provided. The Macropanel is serviced by the computer as an I/O device interfacing with the MACROBUS.

CD 135 core memory comprises modular blocks of 8K or 16K 16-bit words each contained on a single printed-circuit board. Each module plugs directly into the MACROBUS and is treated as an I/O device in the system. The maximum system capacity is 128K words (256K bytes). Two identical modules can be interleaved to achieve an increased effective throughput rate on the MACROBUS.

Features

The CD 135 Computer architecture combines general microprogramming capability with specialized optional features to permit high emulation speeds with efficient control-memory space utilization. The mechanical design used provides full modularity, mounting flexibility and service convenience. Cooling, power distribution and other critical system requirements are optimized. Conservative electrical implementation ensures wide margins, readily available components and reliable operation over a wide environmental range. Subassemblies are designed for easy assembly and automated testing, and the overall system is structured for simple, straightforward manufacturing procedures. Basic design features of the system are:

- 48-bit microcommand word length

- Parallel execution of multiple functions per microcommand

- 165-ns microcommand execution time

- 16-bit data word length

- 16 multipurpose file registers (16 bits each)

- Nine additional registers accessible by microcommand

- 16-level hardware push-down stack

- Microcommand sequence repeat loop counter

- Optional high-speed emulation instruction decode, function generation and interrupt-response hardware

- Bit, byte and word manipulations

- 256 to 4,096-word control memory using bipolar ROM or PROM devices

- Power-failure/restart circuitry included in the computer

- Unique, control-memory "overlay" provisions

- Integral Line Frequency Clock

- Optional Multiply, Divide, and single- and double-precision Shift microcommands

- Hardware microprogram interrupts

Memory and Input/Output:

- 8K-word (675-ns cycle, 275-ns access) and 16K-word (850-ns cycle, 300-ns access) core memory modules

- Interleaved data transfers between memory modules

- Optional 7K-word or 15K-word extended addressing feature for memory expansion to 31K without memory management

- Expansion to 124K or 127K of directly addressable memory with optional Memory Management Unit

- Universal asynchronous I/O channel (MACROBUS) with direct-memory-access capability

- Four external priority-interrupt levels

- 16-bit parallel word or byte-mode transfers

- Automatic MACROBUS delay time-out protection

- Optional asynchronous serial I/O channel

Microprogramming Aids:

- Microcontrol panel (Microconsole)

- Alterable Control Memory and support software

- Microprogramming System (MPS) with Microassembler

Packaging, Power and Environmental:

- 10.5-inch computer chassis with vertical board mounting from the top

- Printed-circuit backplane with up to eight spare slots for memory and I/O controller boards

- Four fans for high-volume, positive-pressure air flow through the chassis with provision for air filters

- Modular power supply providing 36 A at +5 Vdc

- Low-noise internal power distribution and grounding system

- Convenient external I/O cabling

- 0 to +50° C ambient operating temperature

- 10 to 90% relative humidity, without condensation

3.2   COMPUTER OPTIONS

A comprehensive selection of computer options allows the user the ability to more closely tailor the computer to fit current and future requirements.

A Programmable Real-Time Clock (PRTC) provides programmed real-time interval interrupts through a cyrstal-controlled clock for accuracy.

A Memory Management Unit (MMU) allows the user to access beyond 28K words of memory to the full 128K words supported by the computer. In addition, it provides the means for assigning pages (relocatable memory segments) to a user program and prevents that user from making any unauthorized access to those pages outside his assigned area.

The Bootstrap Loader options give the computer 128 consecutive words of unalterable memory locations for bootstrap programs. The customer can specify a custom bootstrap program or the standard CAL DOS disk bootstrap.

The Extended Instruction Set (EIS) option allows extended manipulation of fixed-point numbers. The Floating Point (FIS) option includes all of the EIS instructions and also enables direct operations on single-precision 32-bit words. Both options are contained on existing boards and require no additional computer space. The EIS option adds the following instructions:

    MUL   Multiply
    DIV   Divide
    ASH   Arithmetic Shift
    ASHC   Arithmetic Shift Combined

In addition to EIS and EIS with FIS, either option can also be ordered with the following instruction added:

    EFM   Enter Firmware Mode

This instruction provides the link between user-developed microcode (firmware) and user-developed software.

To facilitate the use of space available in the computer, three mounting units are offered. These include:

    LMMU   Large Memory Mounting Unit
    SPMU   Small Peripheral Mounting Unit
    BPMU   Blank Peripheral Mounting Unit

In addition to the options described above, various custom options are also available. Contact DATA 100 for your unique requirements.

3.3 CARD READERS

The card readers are "stand-alone" units with their own power supply, control panel and controller logic all contained within a single cabinet. All units are free-standing, table-top configurations.

The card reader converts punched data on 80-column cards to electronic signals acceptable to the computer system. This conversion is accomplished by use of a photoelectric circuit that senses the presence of punched holes as the cards pass through the read station.

The following paragraphs list the features available for each of the various card readers.

300 CPM Reader

- Reads punched cards at a nominal rate of 300 cpm

- Common fiber-optic light source with an individual photodiode sensor for each row on the punched card

- Error-detection circuitry that checks for card jams, light/dark response and misregistration

- Input hopper and output stacker each have a card capacity of 1000 cards

- Dynamic load and unload capability

- Card reader control panel

600 CPM Reader

- Reads punched cards at a nominal rate of 600 cpm

- Individual light source and phototransistor sensor for each row on the punched card

- Error-detection circuitry that checks for card jams, light/dark response and misregistration

- Input hopper and output stacker each have a card capacity of 1000 cards

- Dynamic load and unload capability

- Card reader control panel

1000 CPM Reader

- Reads punched cards at a nominal rate of 1000 cpm

- Individual light source and phototransistor sensor for each row on the punched card

- Error-detection circuitry that checks for card jams, light/dark response and misregistration

- Input hopper and output stacker each have a card capacity of 1500 cards

- Dynamic load and unload capability

- Card reader control panel

3.4 LINE PRINTERS

The line printers provide printed output for the Model Ten Computer System. The line printers are "stand-alone" units, consisting of a printer mechanism, power supplies, an operator control panel, a maintenance control panel and controller logic, all contained within a single cabinet.

Line printers are available at printing speeds of 125 to 1000 lines per minute (lpm). The line printers are offered in two families:

    a. Horizontal-font line printers:

        125 lpm
        250 lpm

    b. Drum line printers:

        400 lpm
        600 lpm
      1000 lpm

3.4.1 Horizontal-Font Line Printers

The 125 and 250 lpm horizontal printers are electromechanical line-at-a-time, back-printing, belt printers. A 132-character print line is standard. The standard character set is 64-character ASCII. Options allow 48 or 96-character ASCII.

125 and 250 LPM Printers

- 132-column print line standard

- 48-, 64- or 96-character sets

- Two program-selectable forms-control channels

- "Whisper" cabinet fully encloses printer and paper supply

- Ten characters-per-inch (cpi) horizontal density

- Switch-selectable six or eight lines-per-inch (lpi) vertical density

- Handles six-part forms up to 16 inches wide

3.4.2   Drum Line Printers

The 400, 600 and 1000 lpm drum printers use a rotating drum to generate print. Print type is modified, open Gothic at ten cpi horizontal density, and switch-selectable six or eight lpi vertical density. The vertical spacing (forms advance) is program selectable. The vertical spacing can be single, double or triple space, or as determined by the vertical format tape. A suppress-line-advance feature is also program selectable.

A vertical-format tape reader is provided within the line printer and offers eight or twelve program-selectable forms control channels. The format tape is easily changed to permit the user to adapt the line printer to a particular form.

The following paragraphs list the features available for each of the various line printers.

400 LPM Printer

- Line width of 132 columns

- Printing speeds up to 400 lpm

- Twelve program-selectable forms control channels

- Ten cpi horizontal density

- Switch-selectable six or eight lpi vertical density

- End-of-forms control

- Horizontal tab

- Static eliminator

- Adjustable forms position and paper tension to accommodate multiple-part forms (up to six parts) at widths of 4.0 to 19.25 inches and lengths up to 22 inches between folds

- Adjustable character phasing control

- Operator control panel

- Maintenance panel provided for field maintenance personnel

600 LPM Printer

- Line width of 132 columns

- Printing speeds up to 600 lpm

- Twelve program-selectable forms control channels

- Ten cpi horizontal density

- Switch-selectable six or eight lpi vertical density

- End-of-forms control

- Horizontal tab

- Static eliminator

- Adjustable forms position and paper tension to accommodate multiple part forms (up to six parts) at widths of 4.0 to 20.5 inches and lengths up to 22 inches between folds.

- Adjustable character phasing control

- Operator control panel

- Maintenance panel provided for field maintenance personnel

1000 LPM Printer

- Line width of 132 columns

- Printing speeds up to 1000 lpm

- Twelve program-selectable forms control channels

- Ten cpi horizontal density

- Switch-selectable six or eight lpi vertical density

- End-of-forms control

- Horizontal tab

- State eliminator

- Adjustable forms position and paper tension to accommodate multiple part forms (up to six parts) at widths of 5.0 to 19.0 inches and lengths up to 22 inches between folds

- Adjustable character phasing control

- Operator control panel

- Maintenance panel provided for field maintenance personnel

3.5   DISK SYSTEM

The Model Ten Computer System can be configured with high-speed disk storage capability of from 2.5 to 160 megawords. Disk storage capability is offered in two basic families:

a.   One to four disk cartridge drives of 2.5 or 5 megawords each

b.   One to four disk storage drives of 20 or 40 megawords each

Cartridge Disk

The cartridge disk drives feature more performance in less space for a lower cost than comparable drives. The top-loading disk drives use IBM 5440-type cartridges. The cartridge disk controller handles the following disk drives:

a.   2.5-megaword drive (one fixed disk, one removable)

b.   5.0-megaword drive (one fixed disk, one removable, double density)

The disk controller is a separate chassis that plugs onto the Cal Data MACROBUS and requires no computer space. It features control for up to four drives with overlapped operations and status indicators.

Large Disk

The large disk system consists of a 20- or 40-megaword controller and one to four 20- or 40-megaword removable disk-pack storage modules.

Features:

- Up to four storage modules per controller

- "Soft" sectors (programmable)

- Multiple-sector transfer with automatic surface and cylinder increment

- Cyclic-redundancy-check (CRC) error detection

- A high-speed memory through which 256 16-bit data words can be buffered between storage modules and the MACROBUS

- A write-protect switch per drive

- A display panel where major disk controls and controller states are displayed

- Rack-mounted controller

3.6 MAGNETIC TAPE SYSTEM

The magnetic tape equipment that is used with a Model Ten Computer System accepts data from the system and writes it on standard 0.5-inch, computer-grade magnetic tape. Data stored on tape is read from the tape and converted to signals used within the computer system.

Magnetic tape units are available that can record tape densities of 556, 800 and 1600 bits per inch (bpi), using the NRZI or PE recording formats. Seven- and nine-track units are available.

The following paragraphs list the features available for each of the various magnetic tape units.

556- or 800-BPI, 7-Track Tape Transport

- Uses industry-standard 10.5-inch tape reels

- Seven-track tape with switch-selectable density of 556 or 800 bpi

- NRZI recording format

- Tape operating speed of 45 ips with 150 ips high-speed rewind

- Gap generation and detection circuitry

- Beginning-of-tape and end-of-tape sensing

- Parity generation and checking circuitry

800-BPI, 9-Track Tape Transport

- Uses industry-standard 10.5-inch tape reels

- Nine-track tape with a density of 800 bpi

- NRZI recording format

- Tape operating speed of 45 ips with 150 ips high-speed rewind

- Gap generation and detection circuitry

- Beginning-of-tape and end-of-tape sensing

- Parity generation and checking circuitry

1600-BPI, 9-Track Transport

- Uses industry-standard 10.5-inch tape reels

- Nine-track tape with a density of 1600 bpi

- Phase encoded (PE) recording format

- Tape operating speed of 45 ips with 150 ips high-speed rewind

3.7 PAPER TAPE

Rack-mounted paper tape peripherals are available in two configurations:

    a. 300-cps paper tape reader

    b. 70-cps paper tape punch

Both use fanfold paper tape.

Paper Tape Reader

The paper tape reader is a unit with a power supply, unidirectional paper tape transport and controller logic all contained within a single cabinet.

The paper tape reader converts data, punched on five-, six-, seven- or eight-level perforated tape, to electronic signals acceptable to the terminal system. This conversion is accomplished by a photoelectric circuit that senses the presence of punched holes as the tape passes over the read head.

Features:

- Reads perforated paper tape at a maximum rate of 300 cps

- Photoelectric read mechanism with common light source

- Error detection circuitry that stops the paper tape reader if it runs out of tape or the tape breaks

- Adjustable tape guide mechanism

Paper Tape Punch

The paper tape punch is a unit with a power supply, tape feed and punch mechanism, and controller logic all contained within a single rack-mounted cabinet.

Features:

- Punches perforated paper tape at a maximum rate of 70 cps

- Separate punch for each of the eight tracks

The CRT operator console is a plug-compatible and software-compatible video replacement for Teletype Model 33 and 35 teleprinters. The interactive terminal duplicates the functions of a teleprinter, but provides the additional capabilities of block-mode message transmission and increased speed. The interactive terminal can be used in either a local or remote mode, and can operate in either half- or full-duplex operation at 1200 bps.

The interactive terminal consists of a keyboard, a memory and a cathode-ray tube (CRT) alphanumeric display. These components are contained in a cabinet suitable for installation on a desk or table top. Characters are displayed on the interactive terminal by selectively unblanking dot positions on a five-by-seven dot matrix.

The interactive terminals uses a memory constructed of MOS integrated circuit shift registers. Data stored in the memory is arranged in such a way that there is a one-to-one correspondence between memory locations and display positions. The data is read from memory and supplied to the display generation circuitry in order to refresh the display at a rate of 50 Hz or 60 Hz, depending on the power line frequency.

Standard Features

The following standard features are common to all CRT operator consoles and may not be altered or excluded:

- Teleprinter-compatible alphanumeric keyboard

- Display set of 64 characters and symbols (including SPACE, per ANSI Standard X3.4-1968, modified by substitution to include left and up arrows)

- Entry-marker and associated controls (including up, down, left, right, home and clear)

- Roll-up of displayed data when a line feed is detected and the entry marker is on the bottom line

- 24-line display

Special Features

The following features are implemented selectively, according to the terminal system application and requirements. Specific application information can be obtained from the nearest DATA 100 sales representative.

- The display line length can be changed from 72 characters to 80 characters, or vice-versa

- Entry-marker code implementation can be enabled or disabled. This feature enables the interactive terminal to generate and transmit entry-marker movement codes when certain marker movement keys are

pressed (↑, ↓, ←, →, CLEAR and HOME) and also enables entry-marker movement when these codes are received by the interactive terminal

● Automatic carriage-return and line-feed operations can be enabled or disabled

4.1   CAL DOS OPERATING SYSTEM

The CAL DOS Operating System is a field-proven software operating system designed to run on a Model Ten Computer System. A user-oriented system, CAL DOS has a wide range of capabilities that permit the operator to make the most effective use of his programs.

The heart of CAL DOS is a set of executive modules, consisting of a resident executive, batch processor, keyboard monitor and one overlay. To minimize core usage, the overlay and keyboard monitor reside on disks until needed. Several unique design features of CAL DOS accommodate more efficient use of the computer:

   a.   Quick-run "slots" reduce program loading time by initiating program loading under control of an abbreviated core-resident directory

   b.   Files can be stored in core-image form to allow additional speed through direct loading

   c.   Files are constructed in a contiguous fashion to avoid extensive searching and linking

I/O Capability

Input/output functions are handled on a concurrent-interrupt basis, which accommodates complete device independence. All user I/O is done on a variable length, byte-string basis to or from logical I/O slots. In systems greater than 8K, CAL DOS capabilities can be extended beyond those of most minicomputer monitors through use of the random, fixed-length-record I/O option.

The system provides for complete file security with no problem of conflicting user files. CAL DOS has four level-naming keys: file name, extension, group code and user code. This accommodates two functions:

   a.   A user can be protected against deletion, renaming or modification

   b.   It allows more than one file with the same name

Additional Programs

In addition to the executive program and system generator (SYSGEN), several other programs are available as part of the CAL DOS package:

Text Editor

The Text Editor is a powerful editing system that allows the programmer to create and modify ASCII source programs.

Macro Assembler

The Macro Assembler translates assembly language source code into relocatable object code.

Linkage Editor

The Linkage Editor accepts one or more relocatable object modules and creates absolute loadable code under user control.

On-Line Debugging Package (ODT)

ODT provides a comprehensive means of debugging user programs.

Utilities

The Utilities program allows file maintenance from the system operator's console.

Device Packing Routine (PACK)

PACK allows no disk data-set fragmentation. This leaves one area of open space on a disk for maximum usage.

FORTRAN IV

FORTRAN IV is an optional higher-level language for scientific applications.

Hardware and Storage Requirements

The basic CAL DOS system requires a Model Ten Computer System with at least 16K words of memory, a disk drive and a Teletype teleprinter or compatible terminal. The system can make use of a maximum of 28K words of core.

CAL DOS supports a wide variety of peripheral devices, including high-speed paper tape reader, paper tape punch and line printer.

CAL DOS requires 3.4K words of resident core storage and dedicated system device storage (disk space) of 40K words.

4.2   CAL DOS-RT OPERATING SYSTEM

CAL DOS-RT is a real-time, multiuser disk operating system. It is designed for real-time applications requiring responses to physical events as they occur, with simultaneous batch processing. The system may function in many application areas, such as:

Data Acquisition

Source collection and processing of data, concurrent execution of user tasks (multiprogramming).

Process Control

Data acquisition, analysis and feedback processing to control the behavior of a continuous process.

Manufacturing Control

Monitors operations; furnishes production and inventory control data.

Development

Simultaneous development of assembler, FORTRAN and BASIC language applications with simultaneous batch processing.

The number of users supported can be extended to whatever number is appropriate to the demands placed on the system and the capability of the system to support those demands. Normally up to 16 users are supported.

In effect, each user is given the impression of having his own CAL DOS computer system. He has access to all systems capabilities, and spooling techniques allows access to all peripherals whether they are immediately available or not. It provides each user with complete program protection and isolation, effective data security and a variety of system utility programs. By combining user-generated microprogrammed firmware routines with applications, the user has a flexibility not available on large-scale systems or in multiprocessor applications.

Using multiprogramming, multitasking, interrupts, priority scheduling, quick-run slots to reduce program load time, memory image files and highly efficient disk utilization, CAL DOS-RT maintains efficient use of the hardware complex, over-lapping equipment resources and responding to events in the order of criticality established by the user. When a high-priority application becomes available, a running application may be checkpointed, written back to disk and replaced by the higher-priority task. When the higher-priority task is completed, the original application is reinstated.

CAL DOS-RT is designed as a priority system. By definition, batch processing is of a lower priority than real-time processing. CAL DOS-RT services several simultaneous tasks as a user demands. At any given

time, any one of the multiple users can have up to 12 disk files open simultaneously. Tasks are given priorities and all processor resources are distributed based on task priority and the resources available to support it.

CAL DOS-RT supports real-time and batch modes simultaneously. The essential differences between these applications are:

Real-time	Batch
● Always core resident	● Swapped between core and disk
● High priority, fixed levels	● Lower priority, round robin within level
● Executes in executive space	● Executes in user space
● Does not use I/O Supervisor	● Uses I/O Supervisor

All memory is managed to provide maximum memory utilization, security and isolation. Program segments that are fetched from disk to construct an application program need not be placed in contiguous memory locations in order to function. Memory segmentation is transparent to program operation. Memory management isolates the program operation of one program from all others and reports attempts to access data not located within the virtual space defined for a program.

During periods when swapping operations are in progress, nonswapped tasks continue to operate, thereby overlapping swap and execution functions. This greatly increases system throughput and the response times observed at a user terminal.

Each user has exclusive use of his own terminal, and can access files he owns or whose security key allows him access to. The user is not concerned with peripheral availability. Output files are automatically spooled on disk. Print spooling is automatically performed by the system and is entirely transparent to the user.

CAL DOS-RT is a highly-flexible, efficient, general-purpose operating system and is completely upward compatible with the CAL DOS single-user system, both in application programs and file structure. Cal DOS-RT on a larger system can readily serve as the development system for smaller CAL DOS application systems.

CAL DOS-RT can operate with a minimum configuration of:

a. CD 135 Computer with 16K words of memory

b. Memory Management Unit

c. Operator console

d. Mass storage device (e.g., cartridge disk)

5.1   GENERAL

The reliability and performance of DATA 100 products is acknowledged throughout the world. To complement our product offering, we have developed a comprehensive customer service capability.

DATA 100 today provides support in:

- Systems maintenance

- Documentation

- Education

- Service coordination

- Field engineering

The DATA 100 Field Engineering Division numbers over 420 personnel located in more than 100 service centers. Its 1974 national average response time to service calls was 1.98 hours, a figure unequaled in the industry.

5.2   PURCHASED-SYSTEM SUPPORT

The services and support that are included with a purchased system maintained by DATA 100 are described in the following paragraphs.

On-site Installation

All equipment at all sites is installed and its operation is verified by DATA 100 Field Engineering personnel. The equipment must be formally accepted by the customer to his satisfaction before the installation is deemed to be complete.

On-site Training

Customer personnel who will operate the equipment are trained in its proper operation at installation time.

Full Documentation

All systems include full operation and maintenance documentation. In addition, the central site is provided with a full publication library that includes operation, maintenance and system documentation for hardware and software.

SECTION 6
INSTALLATION CONSIDERATIONS

6.1 SITE PREPARATION

The Model Ten Computer System is designed to operate in a normal office environment, thus eliminating the need for special cooling or other environmental control equipment. The user should be aware, however, of certain site preparations.

The user must provide adequate power and space for the installation of the selected computer configuration as outlined in Table 6-1.

Table 6-1. Model Ten Computer System Installation Data

Product	Power 60 Hz, 115 Vac Watts	Heat Btu/hr	Height inches	Height cm	Width inches	Width cm	Depth inches	Depth cm	Weight lbs	Weight kg	Temperature Range ° F	Temperature Range ° C	Relative Humidity
Computer	1300 (max)	4433	10.5	26.7	19.0	48.3	24.0	61.0	100	45.4	32-122	0-50	10-90%
Microconsole	(CPU)		10.5	26.7	19.0	48.3	3.3	8.4	15	6.8	32-122	0-50	10-90%
Expansion Box	1300 (max)	4433	10.5	26.7	19.0	48.3	24.0	61.0	100	45.4	32-122	0-50	10-90%
Cabinet, 65 in. H	30	102	65.3	165.7	25.5	64.8	39.0	99.1	200	90.8	32-122	0-50	10-90%
Cabinet, 72 in. H	30	102	72.0	182.9	25.5	64.8	39.0	99.1	225	102.2	32-122	0-50	10-90%
300-CPM	287	979	23.0	58.4	19.0	48.3	18.0	45.7	85	38.6	50-100	10-38	30-90%
600-CPM	575	1961	16.0	40.6	18.0	45.7	23.0	58.4	76	34.5	50-100	10-38	30-90%
1000-CPM	780	2660	18.4	46.7	23.0	58.4	27.0	68.6	130	59.0	50-100	10-38	30-90%
125/250-LPM	400	1364	40.5	102.9	30.0	76.2	28.0	71.1	290	131.7	60-90	15-32	10-90%
400-LPM	980	3342	46.0	116.8	46.0	.16.8	31.0	78.7	800	363.2	60-90	15-32	10-90%
600-LPM	1380	4706	46.5	118.1	46.6	.18.4	36.0	91.4	900	408.6	60-90	15-32	10-90%
1000-LPM	2300	7843	47.0	119.4	49.0	.24.5	30.0	76.2	830	376.8	60-90	15-32	30-90%
Cartridge Disk Controller	230	784	5.3	13.3	17.5	44.5	22.9	58.1	20	9.1	60-90	15-32	20-80%
Cartridge Disk Drive	175	597	8.7	22.1	19.0	48.3	22.0	55.9	65	29.3	50-100	10-38	20-80%
Large Disk Controller	400	1364	5.3	13.3	19.0	48.3	22.0	55.9	50	22.7	30-100	0-40	10-90%
Large Disk Drive	690	2353	34.0	86.4	19.0	48.3	34.0	86.4	218	99.0	60-90	15-32	20-80%
Magnetic Tape Controller	200	682	1.8	4.4	19.0	48.3	12.0	30.5	20	9.1	60-90	15-32	10-90%
Magnetic Tape Drive	300	1023	24.5	62.2	19.0	48.3	12.0	30.5	130	58.5	60-90	15-32	20-95%
Paper Tape Reader	70	239	7.5	19.1	19.0	48.3	9.5	24.1	13	5.9	32-122	0-50	10-90%
Paper Tape Punch	200	682	10.5	26.7	19.0	48.3	12.8	32.4	27	12.2	32-122	0-50	10-90%
CRT Operator Console	184	627	15.0	38.1	20.0	50.8	23.0	58.4	85	38.6	32-122	0-50	10-90%
Teleprinter Console	200	682	34.0	86.4	22.0	55.8	19.0	48.3	56	25.4	60-95	15-35	20-80%

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