

# Microdata Reality Series

## MANAGEMENT SUMMARY

The original Microdata Reality was introduced in 1973 as an entry-level, time-sharing business system based on an unusually simple but powerful file management system. The system was good for typical business and accounting procedures and especially well suited for data-file-dependent tasks such as inventory control; but its computational characteristics were limited. In July 1975, Microdata added the DATA/BASIC language processor, an enhanced version of the Dartmouth BASIC language. With the addition of DATA/BASIC, the computational aspects of Reality were substantially increased.

In October 1977, Microdata officially introduced an enhanced version of Reality referred to as the Royale systems. Royale offers up to 128K bytes of core memory—twice the capacity available on Reality systems—and an estimated 400 percent increase in firmware, devoted primarily to operating system functions and diagnostics. The result of these enhancements is a significant increase in system throughput speed.

In May 1979, Microdata announced the release of a new Reality family of computer systems. In addition to new configurations, pricing, and hardware sub-systems, several new enhancements were added to the Reality operating system. All systems are now equipped with the advanced firmware, so the Royale designation has been discontinued.

The new Reality family consists of four series of computer systems, the 2000, 4000, 6000, and 8000. The systems offer from 16K to 512K bytes of main memory and up to 514.8MB of disk storage. Also included are new magnetic tape subsystems; a new selection of printers

Microdata's Reality family currently consists of the 2000, 4000, 6000, and 8000 line of systems. The 2000, 4000, and 6000 models are functionally equivalent to Microdata's earlier Reality II, Reality, and Royale systems, respectively. The 8000 system are the company's new top-of-the-line systems.

**MAIN MEMORY:** 16K to 512K bytes  
**DISK CAPACITY:** 10 to 514.8 megabytes  
**WORKSTATIONS:** Up to 32  
**PRINTERS:** 165 cps to 600 lpm  
**OTHER I/O:** Magnetic tape

## CHARACTERISTICS

**MANUFACTURER:** Microdata Corporation, 17481 Red Hill Avenue, Irvine, California 92705. Telephone (714) 540-6730.

In September 1979, Microdata was acquired by the McDonnell Douglas Corporation. Microdata currently is operating as a unit under McDonnell Douglas' MICD Holding Company subsidiary.

Microdata is a manufacturer of microprogrammable minicomputers for business and scientific applications. The current product line includes the Series 2000, 4000, 6000, and 8000 minicomputers. The company also manufactures tape drives, matrix printers, disc drives, and CRT display terminals. Microdata currently employs about 1,850 persons and maintains manufacturing facilities in Irvine and Santa Ana, California, in Barbados, and in Puerto Rico. Sales offices are located in western Europe, Canada, South Africa, and South America.

**DISTRIBUTORS:** Reality systems are available from authorized dealers through either purchase or lease.



The top-of-the-line Reality Series 8000 was introduced in October 1979 and includes two models, the 8750 and 8770. The basic 8750 configuration includes 256K bytes of MOS memory and 128 million bytes of disk storage. A basic 8770 system includes 256K bytes of MOS memory and 256 million bytes of disk storage. Both models are expandable to up to 514 million bytes of disk storage and up to 32 CRT terminals.

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▷ consisting of a 165 cps matrix printer, and 150, 300, and 600 lpm printers; and up to 32 Prism CRT operator terminals. A new interactive screen processor, SCREEN-PRO, was also introduced which guides the Reality user through a menu driven sequence of steps to set up terminal displays and to provide for the simplified creation of programs for data input and file maintenance procedures. MOS memory was also introduced with this announcement in larger systems.

The Series 8000 is Microdata's newest and largest member of the Reality family. Announced in October 1979, the 8000 is fully compatible with the smaller Reality systems.

The Reality family of data base management systems (DBMS) feature modular expandability within and across each series. The new systems are designed to meet the needs of first time users with entry level data processing requirements; the more sophisticated user whose needs demand advanced data base management and communications capability in central or remote locations; and the major systems house market. In addition, the family offers users a natural way to upgrade their systems as their organizations grow and their data processing needs increase.

A significant characteristic that makes the Microdata business systems unique is the implementation of key system functions in firmware. Typically, multi-user systems of this type spend large amounts of processor time managing disc operations and performing operating system overhead functions. Microdata, however, has implemented a virtual memory management system with the multi-user operating system, the I/O processors, and special data management functions in microcode—an approach that greatly enhances system performance. The result is a flexible, transaction-oriented data base management system that is capable of supporting up to 32 concurrent users and is accessed through the simplified ENGLISH language.

Three major system elements are implemented in microcode, or firmware: 1) the virtual memory operating system, 2) the data base management and manipulation functions, and 3) transaction-terminal input/output routines. Since the firmware is microcode-implemented in high-speed read-only memory, many of the system control functions normally performed by conventional software are executed with above-average efficiency by the Microdata systems.

The virtual storage function involves the "paging" of 512-byte pages between core memory and disc. Disc accessing is not handled as explicit priority I/O by a memory-resident operating system, but rather is implicit in the "machine instructions." This approach greatly reduces the overhead (or system degradation) and eliminates programmer concern when processing page faults. System software not implemented in firmware is demand paged; i.e., it is transferred automatically by the firmware into core memory as needed, to remain only while needed. ▷

▶ These dealers also assume responsibility for software support. Hardware support is provided by the manufacturer.

**MODELS:** Series 2000, 4000, 6000, and 8000, in various submodel packages.

**DATE OF FIRST DELIVERY:** 4000 and 6000 (original Reality line)—November 1973; 2000 (Royale line)—December 1977; 8000—October 1979.

**NUMBER INSTALLED:** Over 2,000 Reality systems.

### DATA FORMATS

The Microdata 1600 processor is not directly accessible to the user, and all data formats are specified by the software system.

**FIXED-POINT OPERANDS:** 8-bit byte, 16-bit word, 32-bit double word, or 48-bit triple word.

**FLOATING-POINT OPERANDS:** Up to 15 decimal digits precision provided through DATA/BASIC.

**INSTRUCTIONS:** All ENGLISH instructions are written in the form of statements consisting of a verb, noun (file name), and optional modifiers. Only one verb is permitted in a single statement. DATA/BASIC statements follow the conventional BASIC format.

### MAIN STORAGE

**TYPE:** Core and MOS.

**CYCLE TIME:** 1 microsecond (core) or 800 nanoseconds (MOS) per fetch of one 8-bit byte.

**CAPACITY:** For the Reality Series 2000 and 4000, 16,384 to 65,536 bytes in 16,384 byte increments; for the Series 6000, 32,768 to 131,072 bytes in 16,384 byte increments; for the Series 8000, 131,072 to 524,288 bytes in 131,072 byte increments. The Series 4000 can be upgraded to the Series 6000 memory capacities, and the Series 6000 can be upgraded to the Series 8000 memory capacities.

**CHECKING:** Core—none; MOS—parity.

**RESERVED STORAGE:** A total of 6144 bytes of low-order memory are dedicated to operating system routines, internal tables, and buffers.

### CENTRAL PROCESSOR

The Microdata business systems are based on the company's 1600 Series minicomputers with an enhanced firmware set. These firmware routines include the virtual memory manager, the multi-user operating system, special data management instructions, and all I/O processors and drivers. The user, however, is isolated from these details, using only verbs, DATA/BASIC programs, and specially defined PROCs, which are user-defined subroutines made up of ENGLISH statements. Please see Report M11-633-101 for complete internal details of the 1600 Series minicomputers.

### INPUT/OUTPUT CONTROL

**I/O CHANNELS:** Printers and CRT display terminals operate through firmware microprogrammed I/O transfers at data transfer rates up to 40,000 bytes per second. Disc transfers are through the DMA channel at data rates up to 1 million bytes per second.

**SIMULTANEOUS OPERATIONS:** All peripheral and processing activities are overlapped within the capability of the memory and processor cycling rates.

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**PERIPHERALS/TERMINALS**

| DEVICE                  | DESCRIPTION AND SPEED   | MANUFACTURER |
|-------------------------|---|--------------|
| MAGNETIC TAPE EQUIPMENT | Transport; 9-track, 25 ips, 800 bpi NRZI, read-after-write, 10.5-inch reels; 20 KBS   | Microdata    |
|                         | Transport; 9-track, 45 ips, 800 bpi NRZI, read-after-write, 10.5-inch reels; 36 KBS   | Microdata    |
|                         | Transport; 9-track, 25 ips, 1600 bpi phase-encoded, read-after-write, 10.5-inch reels; 40 KBS   | Microdata    |
| PRINTERS                | 165 cps, matrix printer   | Microdata    |
|                         | 150 lpm, line printer   | Printronix   |
|                         | 300 lpm, line printer   | Printronix   |
|                         | 600 lpm, line printer   | Printronix   |
| TERMINALS               | Matrix printing terminal keyboard; 132 positions, 96 ASCII character set, bidirectional, printing, and 165 cps. Data rates 110, 300, and 1200 bps.  | Microdata    |
|                         | Prism CRT display/keyboard; 1920 characters, 24 lines of 80 characters, 5 x 7 dot matrix, 64 ASCII characters, 12-inch screen reverse video, EIA RS-232C interface, screen scrolling, direct cursor positioning; data rates to 9600 bps | Microdata    |

➤ Firmware customizes the assembly-language structure of the systems, optimizing the machine architecture for the implementation of ENGLISH, a powerful information management language. The assembly-language instructions are expressly designed for character searches, compares, moves, and management of variable-length data records.

Finally, firmware enables these comparatively small, low-cost systems to handle a large number of terminals in a multiuser, transaction-oriented environment without significant performance degradation through processor overloading.

Six areas which were improved by the level 3 firmware to effect this advantage include calculation speed, terminal I/O, use of disk space, doubling the maximum amount of main memory, process scheduling, and performance monitoring.

Calculation speed was improved by moving several functions into firmware, including: 1) conversions between decimal and binary formats; 2) 48-bit binary arithmetic, including multiply and divide; 3) decoding of BASIC opcodes; 4) copying of data to be operated on within DATA/BASIC; and 5) string comparisons. According to Microdata, the net result is that many DATA/BASIC programs whose speed is determined by CPU speed run two to three times as fast.

Terminal I/O is faster as a result of the implementation of routines in firmware, an increase in buffer sizes, and ➤

➤ **CONFIGURATION RULES**

**WORKSTATIONS:** The Reality 2000 supports up to 8 workstations; the Reality 4000, 6000, and 8000 all support up to 32 workstations. Local terminals can be located up to 1000 feet from the processor. The terminal ports permit local connection, or, with appropriate modems, remote connection of CRTs and printers.

**MASS STORAGE:** The basic 2200 system includes 10-million bytes of disk storage expandable to 20-million bytes; the basic 4520 and 4530 systems contain 20-million and 30-million bytes of disk storage, respectively, both of which can be expanded to 40-million bytes; basic 6550 and 6580 systems include 50-million and 100-million bytes of disk storage, respectively, and both are expandable to 200-million bytes; the Reality 6790 includes 257.4-million bytes of disk storage and can be expanded up to 514.8-million bytes; the basic Reality 8750 and 8770 include 128-million and 256-million bytes of disk storage, respectively, and both can be expanded to include up to 514-million bytes.

**MAGNETIC TAPE:** All Reality Series systems include one magnetic tape unit.

**PRINTERS:** All basic Reality Series systems include one printer differing only in speeds. For the 2200, 4520, 4530 systems the standard printer speed is 165 cps. The 6550 and 6580 systems have 150 lpm printers; the 6790, 8750, and 8770 systems have one 300 lpm printer as standard equipment. Optionally, there is a 600 lpm which can replace any basic system printer at an additional charge.

Additionally, a 165 cps printer can be used as a system printer, attached to the line printer controller, or as a remote printer by itself or with a remote CRT terminal. ➤

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▷ improvements to process scheduling. Microdata states that users whose data entry programs on Reality systems with level 2 firmware are supporting 12 terminals satisfactorily can expect to be able to run 18 or more terminals at the same rate with level 3.

Utilization of program workspace is more efficient with the new software. DATA/BASIC programs which use string variables will show the most improvement, while operations which have much file activity, but use little workspace, will show the least. Another feature is the use of a firmware-implemented hashing technique to locate the position of data in main memory without requiring searches of large tables. Memory and file space is assigned dynamically and is not partitioned.

New hardware registers enable the level 3 systems to address up to 128K bytes of main memory, thus enabling more processes to be run simultaneously. Transfers of data on a system with 128K bytes of main memory go directly to any of 244 page buffers of 512 bytes each. Systems with 10 to 31 terminals will be affected most, according to Microdata. The addition of more main memory will obviously improve terminal response times.

Performance measurement features are designed to spot problem programs, determine the efficiency of program use of the CPU and the disks, and provide statistics for making accounting charges.

In addition to ENGLISH and DATA/BASIC software, Microdata offers SCREENPRO for creating report formats, a stored procedure capability similar to a job control language, and RUNOFF for word processing.

In May 1980, Microdata introduced RESULTS, the company's first applications software package. RESULTS consists of a two-part package that includes nine modules which can be integrated in any combination. The first part, called the RESULTS Financial Management System, consists of five modules—payroll, accounts receivable, accounts payable, general ledger, and financial reporting. The second part, the RESULTS Distribution System, includes order/invoice processing, inventory control, sales analysis, and purchase order processing modules.

### USER REACTION

Forty-two users of Microdata Reality Series systems responded to Datapro's 1980 user survey, representing a total of 50 installed systems. Included in this total were 33 Series 4000 systems, 16 Series 6000 systems, and 1 Series 2000 system. The average length of time the systems were installed was 25 months. Six users leased their systems, while the balance had purchased theirs.

Twenty-seven respondents were using DATA/BASIC and two were using ENGLISH. Accounting and payroll/personnel were the primary applications for these users, but others mentioned included word processing, manufacturing, retail, transaction processing, government, ▷

### ▶ MASS STORAGE

**10-MEGABYTE MARATHON CARTRIDGE DISK DRIVE SUBSYSTEM:** Includes a top-loading disk drive with one fixed and one removable IBM 5440-type cartridge. Up to four drives can be accommodated on one controller. The Reality 2200 is limited to two drives. Data is recorded on four surfaces with 406 tracks per surface. Average rotational delay is 12.5 milliseconds and average head-positioning time is 35 milliseconds. Data transfer rate is 312K bytes per second. The subsystem is manufactured by Microdata.

**REFLEX FIXED DISK DRIVES:** Available only for 4000, 6000, and 8000 systems, these drives feature three or four disks and a formatted capacity of 50 or 128.7 megabytes. There are 700 tracks per surface, and data is recorded at 5636 or 6367 bits per inch. Average rotational delay is 10.1 milliseconds, and average head-positioning time is 30 milliseconds. Data transfer rate is 885,000 or 1,175,000 bytes per second. The Reflex disk drives are manufactured by Microdata.

### INPUT/OUTPUT UNITS

See the Peripherals/Terminals table.

### COMMUNICATIONS CONTROL

A binary synchronous (bisync) interface is available that uses the transmission protocol of an IBM 2780-type RJE/HASP workstation. This interface permits a Microdata system to function as a workstation to an IBM 360/370 host system, or to communicate with a 2780 workstation or another Microdata system.

**MODEL C6557 COMMUNICATIONS SYSTEM:** This packaged communication system provides users with all advantages of the Reality operating system plus communication capabilities for an IBM 2770, 2780, 3741, 3780, or HASP multileaving workstation.

The unique feature of the C6557 system is the 5750 intelligent communications terminal, which includes a 12-inch glare reducing screen, upper/lower case characters set, screen scrolling, video attributes, independent terminal formatting and two-page operation. The two-page function allows the user to interact with the Reality system on one page, while monitoring communications status on the other. Additional features include data compression, extended buffer sizes, binary synchronous communications, and remote job entry.

The basic configuration of the C6557 system features 64KB MOS memory, a 45 ips/800 bpi magnetic tape subsystem, a REFLEX disk subsystem (50 MB), a 150 lpm printer, one 5750 communications terminal and one Prism CRT. It can be expanded to include 128K bytes of MOS main memory, a 45 ips/1600 bpi tape subsystem, 200 MB disk storage, a 600 lpm printer, and up to 31 Prism CRT's.

Presently, the C6557 communication system is intended for use only with the Series 6000 processor, but can operate on all of Microdata's Reality system software.

### SOFTWARE

The Microdata systems are transaction-oriented data base systems that permit up to 32 users to simultaneously retrieve or update information stored in on-line files.

**OPERATING SYSTEM:** The Microdata business systems operate under a 6144 memory monitor, plus a virtual memory manager, a multi-user operating system, input/output processors, and special data management func- ▶

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education, and insurance. Twenty-eight users were using in-house personnel to write their applications programs, 21 were using contract programmers, and 16 were using proprietary software packages.

The table below summarizes the ratings assigned by these users.

|                            | Excellent | Good | Fair | Poor | WA* |
|----------------------------|-----------|------|------|------|-----|
| Ease of operation          | 35        | 7    | 0    | 0    | 3.8 |
| Reliability of mainframe   | 27        | 11   | 2    | 1    | 3.6 |
| Reliability of peripherals | 18        | 19   | 5    | 0    | 3.3 |
| Maintenance service:       |           |      |      |      |     |
| Responsiveness             | 15        | 17   | 8    | 1    | 3.1 |
| Effectiveness              | 13        | 20   | 8    | 1    | 3.1 |
| Technical support:         |           |      |      |      |     |
| Trouble-shooting           | 9         | 18   | 9    | 5    | 2.8 |
| Education                  | 4         | 14   | 11   | 10   | 2.3 |
| Documentation              | 2         | 17   | 10   | 10   | 2.3 |
| Manufacturer's software:   |           |      |      |      |     |
| Operating system           | 26        | 13   | 1    | 0    | 3.6 |
| Compilers and assemblers   | 22        | 18   | 0    | 0    | 3.6 |
| Ease of programming        | 30        | 9    | 2    | 0    | 3.7 |
| Ease of conversion         | 20        | 9    | 4    | 1    | 3.4 |
| Overall satisfaction       | 25        | 11   | 5    | 0    | 3.5 |

\*Weighted Average on a scale of 4.0 for Excellent.

As the ratings assigned indicate, these users were generally happy with their Reality systems. On the negative side, 11 users said that the system proposed by Microdata was too small and had to be replaced or expanded, 6 said that software was delivered later than promised, and 10 users said that the vendor did not provide all of the promised software or support.

On the positive side, 90 percent of the users praised ENGLISH and DATA/BASIC. One user commented "The biggest advantage is being able to use ENGLISH. You can't beat it." Other system advantages cited were response time, expansion/reconfiguration capability, power/energy efficiency, and productivity aids. When asked if they would recommend their Reality system to another user in the same situation, 40 users responded yes. □

► tions implemented in firmware. The virtual-memory operating system is a demand paging system using 512-byte pages or "frames." Frames are "rolled in" or "rolled out" on a frequency-of-usage basis, with the least recently used page in main memory being the first one overlaid. Disc accesses are reduced through a "write required flag" which indicates whether or not the page being overlaid has been altered. If the outgoing page has not been altered (i.e., is identical with the disc copy), no disc write is required. Supported by the monitor are the ENGLISH, DATA/BASIC, and PROC language processors and an editor for program development and debugging. Also included in the system software are the Terminal Control Language processor, the SCREENPRO processor, print spooling, and RUNOFF word processing.

The file management system permits variable-length files, records, or fields, with multiple values (and subvalues) within individual fields. Individual records can be up to 32K bytes long, and file size is limited only by disc capacity. The systems consider all system discs to be a series of surfaces mounted on a single spindle and numbered from "0" to the maximum.

Data/program information is distributed across all disks to minimize accessing times.

Files are randomly organized. Individual files can be reserved for one user or shared among multiple users. Disc addresses of file items are generated by a "hashing algorithm" in which elements such as file name, record identification key, and others are combined and operated on both mathematically and logically to produce a unique virtual memory address. Files are organized on four levels: system dictionary, user master dictionaries, dictionary files, and data files. Dictionary files point to multiple lower-level files.

The system dictionary lists all user master dictionary files and their virtual-memory addresses. It is used by the operating software and also contains pointers to an accounting history file. It contains all legal user identification codes, passwords, file security codes, and system privilege codes.

Each user master dictionary defines all user vocabulary, including user-defined PROC's; identifies all accessible file names, including common files; and lists the attributes that describe the information structure of the file-level dictionaries. The vocabulary is user-definable and may be tailored or expanded as required.

Dictionary files describe each data file structure by relating user data formats to internal data formats. These are the key data definition files for each base. Field definition items are used by ENGLISH and SCREENPRO to define fields in the data records.

Files are handled by the data base management processors, which provide for the creation, deletion, clearing, and copying of files. The CREATE and DELETE verbs add and subtract entries from user master dictionaries. Creating a file automatically reserves disc space for the file from unallocated areas. CLEARing a file clears all data from the file but retains the space reservation in the user master dictionary. Either data files or dictionary files may be CLEARed. COPYing a file permits all or part of the contents to be written to a user terminal, to magnetic tape, to a line printer, to other files, or to the same file under a different identification key.

The Terminal Control Language (TCL) processor is actually part of the operating system. It is the primary interface between each user and the various language processors. Typically, each statement causes transfer to a specific processor such as ENGLISH, DATA/BASIC, or the editor function, which is also considered a processor. TCL expects the first word of each statement to be a verb. An input statement may be longer than one line, but each line must be terminated with a carriage return or line feed character.

TCL also performs user log-on and log-off functions, including security checks. Users must supply a valid identification code and can also be required to supply a password.

All system software is reentrant, requiring only one copy in memory, even if multiple users are accessing the same code.

LANGUAGES: The Microdata business systems currently support the ENGLISH, DATA/BASIC, PROC, SCREENPRO, and RPG II languages.

ENGLISH is a user-oriented information and data retrieval language used for accessing data files. Input to the ENGLISH language processor is in the form of sentences consisting of a verb, file name, optional data selection criteria, and optional control modifiers. The minimum statement must contain a verb and a file name (noun). ENGLISH can perform control breaks and subtotalling. ►

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► The set of ENGLISH verbs consists of: LIST, SORT, COUNT, SUM, STAT (count, sum, average), SELECT (retrieve partial group from file), SSELECT (SORT plus SELECT), T-DUMP (tape dump), I-DUMP (dump to terminal), CHECK—SUM (for one 512-byte page), ISTAT, and HASH-TEST (both produce histograms showing current and proposed disc area utilization). In addition to this nucleus set, combinations of these verbs, along with file names and modifiers, may be assembled into PROC's and named with pseudo-verbs.

*DATA/BASIC* is an enhanced version of the Dartmouth BASIC language. *DATA/BASIC* permits optional statement labels of any length, complex and multi-line IF statements string-handling statements with variable string lengths, 15-digit floating-point arithmetic, ENGLISH statements embedded in the program stream, pattern matching, and provisions for handling dynamic arrays.

*DATA/BASIC* programs are created through the system editor by specifying EDIT, a file name, and a program name. Compilation is initiated, after the program has been created by specifying the verb BASIC. The RUN verb then causes the compiled program to be executed. Programs can be cataloged allowing them to become reentrant.

ENGLISH and *DATA/BASIC* procedures can be freely combined.

SCREENPRO was developed to minimize the software gap between the establishment of data files and the creation of reports. Users do not have to develop their own methods of creating and processing screens to display text, inputs, validations and updates. A screen can be designed, displayed, tested and changed without affecting the program.

The PROC (stored procedure) processor enables the user to prestore a complex sequence of operations which can then be invoked by a single word command. Any sequence of operations that can be executed from the terminal can be prestored in a PROC. PROC is similar to the Job Control Language (JCL) used in larger computer systems, but with greater capabilities including interactive (optionally formatted) terminal prompting, input validation, printer formatting, and file input/output. PROCs are typically used to create special user-defined functions by combining execution of *DATA/BASIC* programs, ENGLISH data retrieval operations, and PROC argument passing.

RUNOFF is a word processing facility offering many special features. RUNOFF processes text entered and modified with the EDITOR, numbers pages automatically, and can print text headings and footnotes. Another RUNOFF feature is chapter and section numbering. New chapters and/or sections may be added to a document,

and the subsequent updated publication, with changes and additions, will be completely renumbered automatically. RUNOFF assembles and prints a table of contents covering all subjects, including corrected/updated copy. RUNOFF also automatically assembles a publication index based on specified words and phrases, and supplies index page numbers. If new pages are added, the index is automatically updated. RUNOFF also performs tabulations, centering, selective left/right justifications, underlining, and boldface printing.

### PRICING

**POLICY:** The purchase prices and terms that follow are suggested single system prices from branch offices and authorized dealers. Maintenance is generally charged on a monthly basis, not including travel outside regional maintenance areas. Hardware maintenance is performed by Microdata personnel, while software support is provided by Microdata distributors and branch offices. Microdata has a technical support group as a back-up for the distributors and branches. One set of documentation is included with each system; extra sets cost \$115 each. Classroom training, with hands-on experience, is held at Microdata headquarters and costs \$500 per student per week. Training is also available through dealers and branches.

**EQUIPMENT:** The following representative system purchase and monthly maintenance prices include all software, control units, cables, adapters, and cabinets.

**SINGLE-USER SYSTEM:** Includes Reality 2200 system with 16K bytes of core memory, 10 megabytes of disk storage, 25 ips/800 bpi tape drive, 1 Prism CRT terminal, and a 165 cps matrix printer. Purchase price is \$32,500 with maintenance at \$290 per month.

**TWO-USER SYSTEM:** Includes Reality 4530 system with 32K bytes of core memory, 30 megabytes of disk storage, 25 ips/800 bpi tape drive, 2 Prism CRT terminals, and a 165 cps matrix printer. Purchase price is \$47,450 with maintenance at \$352 per month.

**SIX-USER SYSTEM:** Includes Reality 6550 system with 64K bytes of core memory, 50 megabytes of disk storage, 25 ips/800 bpi tape drive, 6 Prism CRT terminals, and a 150 lpm printer. Purchase price is \$78,250 with maintenance at \$596 per month.

**LARGE-SCALE, 10 USER SYSTEM:** Includes Reality 6790 system with 128K bytes of MOS memory, 257.4 megabytes of disk storage, 45 ips/1600 bpi tape drive, 10 Prism CRT terminals and a 600 lpm printer. Purchase price is \$129,150 with maintenance at \$756 per month.■

## EQUIPMENT PRICES

| REALITY SYSTEMS |   | Purchase Price | Monthly Maint. |
|-----------------|---|----------------|----------------|
| R2200           | Reality system, 16KB core memory, magnetic tape (25 ips, 800 bpi), 10MB disk storage, printer (165 cps, and 1 CRT terminal)     | \$32,500       | \$290          |
| R4520           | Reality system, 16KB core memory, magnetic tape (25 ips, 800 bpi), 20MB disk storage, printer (165 cps), and 1 CRT terminal     | 38,550         | 280            |
| R4530           | Reality system, 32KB core memory, magnetic tape (25 ips, 800 bpi), 30MB disk storage, printer (165 cps), and 1 CRT terminal     | 44,950         | 335            |
| R6550           | Reality system, 32KB core memory, magnetic tape (25 ips, 800 bpi), 50MB disk storage, printer (150 lpm), and 2 CRT terminals    | 61,250         | 420            |
| R6580           | Reality system, 64KB MOS memory, magnetic tape, (45 ips, 800 bpi), 100MB disk storage, printer, (150 lpm), and 2 CRT terminals  | 75,950         | 495            |
| R6790           | Reality system, 64KB MOS memory, magnetic tape (45 ips, 1600 bpi), 257.4MB disk storage, printer (300 lpm), and 2 CRT terminals | 93,950         | 595            |
| R8750           | Reality system, 256KB MOS memory, magnetic tape (45 ips, 800 bpi), 128MB disk storage, printer (300 lpm), and 2 CRT terminals   | 84,975         | 580            |

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## EQUIPMENT PRICES

|                                    |   | <u>Purchase<br/>Price</u> | <u>Monthly<br/>Maint.</u> |
|------------------------------------|---|---------------------------|---------------------------|
| <b>REALITY SYSTEMS (Continued)</b> |   |                           |                           |
| R8770                              | Reality system, 256K MOS memory, magnetic tape (45 ips, 1600 bpi), 256MB disk storage, printer (300 lpm), and 2 CRT terminals   | 106,275                   | 715                       |
| C 6557                             | Series 6000 Communications System; includes 64K MOS memory, 45 ips/800 bpi magnetic tape subsystem, Reflex disk subsystem (50MB), 150 lpm printer and stand, one 5750 communications terminal with port, one Prism CRT, and one open port       | 67,875                    | 480                       |
| <b>MEMORY</b>                      |   |                           |                           |
| 1416                               | 16K-byte core (128K bytes max.)   | 3,500                     | 54                        |
| 1547                               | MOS memory expansion (64 to 96 KB)  | 3,900                     | 25                        |
| 1549                               | MOS memory expansion (64 to 128 KB)   | 6,900                     | 40                        |
| 1569                               | MOS memory expansion (96 to 128 KB)   | 3,900                     | 25                        |
| <b>MAGNETIC TAPE</b>               |   |                           |                           |
| 1924-44                            | Substitute 45 ips/800 bpi magnetic tape for 25 ips/800 bpi  | 1,700                     | —                         |
| 1924-48                            | Substitute 45 ips/1600 bpi magnetic tape for 25 ips/800 bpi   | 2,700                     | 15                        |
| 1944-48                            | Substitute 45 ips/1600 bpi magnetic tape for 45 ips/800 bpi   | 1,500                     | 15                        |
| <b>MASS STORAGE</b>                |   |                           |                           |
| 4210                               | 10-megabyte Marathon disk add-on (for use as a second drive on R2200)   | 9,400                     | 88                        |
| 4551                               | 50-megabyte Reflex disk sub-system; includes controller; for use as third drive on R4520, R4530, R6550, R6580, R8750, and R8770   | 18,000                    | 135                       |
| 4550                               | 50-megabyte Reflex disk add-on; requires 1840-60 feature for R4520 and R4530; for use as second or fourth drive on R6550, R6580, R8750 and R8770  | 11,900                    | 100                       |
| 1745-23                            | Reflex disk expansion (20 to 30 MB)   | 6,200                     | 10                        |
| 1745-24                            | Reflex disk expansion (20 to 40 MB)   | 4,900                     | 20                        |
| 1745-34                            | Reflex disk expansion (30 to 40 MB)   | 6,200                     | 10                        |
| 1845-45                            | Reflex disk expansion (40 to 50 MB); requires original disk expansion to 40MB and upgrade kit 1840-60   | 6,200                     | 10                        |
| 1840-60                            | Series 4000 upgrade kit; permits expansion to 128K memory and beyond 40MB disk storage on R4520 and R4530   | 5,100                     | 30                        |
| <b>PRINTERS</b>                    |   |                           |                           |
| 5166                               | Matrix Printer, 165 cps, 96-characters, 132 positions, bi-directional, includes controller and cable  | 5,200                     | 50                        |
| 5316                               | Line Printer, 150 lpm, 132 positions, 64 characters, includes controller and cable  | 8,600                     | 70                        |
| 5331                               | Line Printer; same as 5316 except 300 lpm   | 11,200                    | 85                        |
| 5361                               | Line Printer; same as 5316 except 600 lpm   | 15,900                    | 110                       |
| 5122                               | Matrix Printer, serial, receive only—interface to port  | 4,600                     | 50                        |
| 5550                               | Matrix Printer; same as 5122 except interface to terminal   | 4,600                     | 50                        |
| 1916-33                            | Substitute 300 lpm printer for 165 cps printer  | 6,000                     | 35                        |
| 1916-36                            | Substitute 600 lpm printer for 165 cps printer  | 10,700                    | 60                        |
| 1931-33                            | Substitute 300 lpm printer for 150 lpm printer  | 2,600                     | 15                        |
| 1931-36                            | Substitute 600 lpm printer for 150 lpm printer  | 7,300                     | 40                        |
| 1933-36                            | Substitute 600 lpm printer for 300 lpm printer  | 4,700                     | 25                        |
| 5816                               | Printer stand for matrix printer (5166, 5122, 5540 or 5550)   | 175                       | —                         |
| 5817                               | Printer stand for line printer (5316, 5331, or 5361)  | 175                       | —                         |
| <b>TERMINALS</b>                   |   |                           |                           |
| 5410                               | Prism CRT display/keyboard; includes 1920 characters, 24 lines of 80 characters, 5 x 7 dot matrix, 64 ASCII characters, 12 inch screen reverse video, EIA RS-232C interface, screen scrolling, direct cursor positioning, data rate to 9600 bps | 2,500                     | 17                        |
| 5540                               | Matrix printing terminal keyboard, 132 positions, 96 ASCII character set, bi-directional printing, 165 cps; data rates 110, 300, and 1200 bps   | 5,500                     | 50                        |
| <b>COMMUNICATIONS</b>              |   |                           |                           |
| 5710                               | Single line 2780 bisync controller  | 4,450                     | 85                        |
| <b>CHASSIS/CABINETS</b>            |   |                           |                           |
| 5836                               | Expansion cabinet, style B; 47 inches vertical rack space (R2200, R4520, R4530; and R6650)  | 1,200                     | —                         |
| 5837                               | Expansion cabinet, style C; 47 inches vertical rack space (R6580 or R6790)  | 1,200                     | —                         |
| 5846                               | I/O Expansion chassis; provides 19 additional card slots and power supply; requires expansion cabinet   | 3,750                     | 26                        |

## Microdata Reality Series

### SOFTWARE PRICES

|                                     | <u>Purchase<br/>Price</u> |
|-------------------------------------|---------------------------|
| RESULTS Financial Management System |                           |
| Payroll                             | \$2,500                   |
| Accounts Receivable                 | 1,800                     |
| Accounts Payable                    | 1,800                     |
| General Ledger                      | 1,500                     |
| Financial Reporting                 | 1,000                     |
| RESULTS Distribution System         |                           |
| Order and Invoice Processing        | 3,000                     |
| Inventory Control                   | 2,500                     |
| Sales Analysis                      | 1,000                     |
| Purchase Order Processing           | 1,200                     |