

Honeywell Series 200 and 2000

MANAGEMENT SUMMARY

The Honeywell Series 200, introduced in December 1963, ranks as one of the computer industry's broadest, longest-lived, and most successful product lines. After a highly profitable eight-year marketing career, the Series 200 was effectively superseded by the Honeywell Series 2000, announced in January 1972. Designed primarily as program-compatible growth systems for Honeywell's large customer base of small-scale Series 200 users, the capabilities and pricing of the Series 2000 computers make them attractive to many users of competitive equipment as well.

With the advent of the Series 2000, Honeywell's marketing efforts in the medium-scale field naturally shifted from the Series 200 to the newer product line. But the Series 200 peripheral equipment and software remain very much alive as integral components of the newer Series 2000 systems.

The original Honeywell 200 system was conceived with one specific marketing goal in mind: replacement of thousands of IBM 1400 Series computers, which were by far the most widely used business data processing systems of the second generation. The Honeywell 200 offered about five times the internal processing speed of the 1401, plus greatly improved simultaneity, at a slightly lower purchase or rental price. Moreover, the 200's data formats and instruction repertoire were quite similar to those of the 1401, and a series of "Liberator" routines largely automated the task of program conversion.

Through a succession of hardware enhancements, more advanced operating systems, and new peripheral devices, Honeywell has evolved its long-lived Series 200 computer family into the current Series 2000. Models 2020 through 2070 of the Series 2000 are now the actively marketed processors in this extensive product line. They offer attractive price/performance and unique flexibility for on-site upgrading of both rented and purchased systems.

CHARACTERISTICS

MANUFACTURER: Honeywell Information Systems Inc., 60 Walnut Street, Wellesley Hills, Mass. 02181. Telephone (617) 237-4100.

MODELS: Series 200, Models 105 through 8200, and Series 2000, Models 2020 through 2070.

DATA FORMATS

BASIC UNIT: 6-bit character. Each character position in core storage consists of 6 data bits, 2 punctuation bits, and 1 parity bit, and can represent 1 alphanumeric character, 1 decimal digit, or 6 binary bits. (The Model 8200 word processing subsystem uses a fixed-length word consisting of 48 data bits and 8 parity bits.)

FIXED-POINT OPERANDS: Variable length; can range from 1 character of the capacity of core storage. (The Model 8200 word processing subsystem uses fixed-length operands of 48 data bits.)



This Model 2060 tape/disk system, arranged in a distinctive Y-shaped configuration, is equipped for multiprogramming and communications processing. The Visual Information Control Console is at the far left and the DATANET 2000 Communications Processor at the far right.

REFERENCE EDITION. This is a mature product line, and no significant further developments are anticipated. Because of its importance, coverage is being continued, but no further update is planned.

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CHARACTERISTICS OF THE SERIES 200 PROCESSOR MODELS

	Model 105	Model 110	Models 110-2, 110-3	Model 115	Model 115/2	Models 120, 120-0	Model 120-3	Model 125	Model 125-3
DATE INTRODUCED	1971	1968	1968	1970	1971	1965	1965	1967	1967
MAIN STORAGE									
Cycle time, microseconds	3.5	4.0	4.0	2.75	2.25	3.0	3.0	2.5	2.5
Chars. fetched per cycle	1	1	1	1	1	1	1	1	1
Minimum capacity, chars.	16,384	4,096	8,192	16,384	32,768	2,048	8,192	4,096	8,192
Maximum capacity, chars.	32,768	32,768	32,768	32,768	65,536	32,768	32,768	65,536	32,768
PROCESSOR									
Processor type no.	106	111	114, 113	116	117	121, 121-0	121A	126	127
Add time, microseconds (5-digit decimal fields)	80	92	92	66	54	69	69	58	58
Add time, microseconds (30-bit binary fields)	80	92	92	66	54	69	69	58	58
Max. no of index registers	6	6	6	6	6	6	6	6	6
Processor features:									
Advanced Programming	std.	opt.	std.	std.	std.	opt.	std.	opt.	std.
Edit Instruction	std.	opt.	std.	std.	std.	opt.	std.	opt.	std.
Multiply & Divide	no	no	no	no	std.	no	no	no	no
Scientific Instructions	no	no	no	no	no	no	no	no	no
Storage Protection	no	no	no	no	no	no	no	no	no
Extended Multiprog'g.	no	no	no	no	no	no	no	no	no
8-Bit Transfer	opt.	no	no	opt.	std.	no	no	no	no
CHANNELS									
No. of I/O channels	3	3	3	3	3 or 4	3	3	3 or 4	4
Max. no of peripheral controls	8	6	6	8	16	9	9	9	9
Max. no of simultaneous I/O operations	3	2	2	3	4	3	3	4	4

➤ The Honeywell 200 achieved its initial marketing goal in spectacular fashion, and sales continued at a brisk pace after the April 1964 introduction of the IBM System/360. IBM's third-generation product line turned out to be totally different from its 1400 Series, and many 1400 Series users found Honeywell's Liberator approach to program conversion more attractive than the IBM emulators, which kept users "locked in" to an obsolete language and sub-par performance.

The original Honeywell 200, however, lacked many of the features which were strongly emphasized in the third-generation computer families such as the System/360. The 200 used discrete-component solid-state circuitry and initially offered little in the way of operating systems, random-access storage, data communications facilities, or larger program-compatible processors.

When Honeywell's primary market for the Series 200 necessarily shifted from IBM 1400 Series users to System/360 and System/370 users and prospects, the firm labored mightily to bring the Series 200 up to "third-generation standards" in every respect. Numerous mass storage devices are now available, with appropriate supporting software. The more recent additions to the Series 200 processor line and all of the Series 2000

➤ **FLOATING-POINT OPERANDS:** 8 characters, consisting of a 36-bit binary fraction and a 12-bit binary exponent. (The Model 8200 word processing subsystem uses one 48-bit word, consisting of a 40-bit binary or BCD fraction and a 7-bit binary exponent.)

INSTRUCTIONS: Variable length; can range from 1 to 12 or more characters, though 7 characters is the most common length. Every instruction includes a 1-character operation code, and most may also include one or two memory addresses and/or one or more variant characters.

Memory addresses may be 2 or 3 characters long in Models 105 through 125-3, and 2, 3, or 4 characters long in Models 200 and above; but only 3- or 4-character addresses can be modified by indexing or indirect addressing. (The Model 8200 word processing subsystem uses 48-bit instructions consisting of an operation code and three memory addresses.)

INTERNAL CODE: 6-bit BCD.

MAIN STORAGE

STORAGE TYPE: Magnetic core.

CYCLE TIME: See table.

CAPACITY: See table.

CHECKING: Parity bit with each character is generated during writing and checked during reading.

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CHARACTERISTICS OF THE SERIES 200 PROCESSOR MODELS

	Model 200	Model 1015	Model 1200	Model 1250	Model 2015	Model 2200	Model 3200	Model 4200	Model 8200
DATE INTRODUCED	1963	1971	1965	1967	1971	1964	1969	1965	1965
MAIN STORAGE									
Cycle time, microseconds	2.0	1.6	1.5	1.5	1.3	1.0	1.0	0.75	0.75
Chars. fetched per cycle	1	1	1	1	2	1	2	4	4 or 8
Minimum capacity, chars.	4,096	65,536	16,384	32,768	98,304	16,384	131,072	131,072	262,144
Maximum capacity, chars.	65,536	131,072	131,072	262,144	262,144	262,144	524,288	524,288	2,097,152
PROCESSOR									
Processor type no.	201-2	1016	1201	1251	2016	2201	3201	4201	8201
Add time, microseconds (5-digit decimal fields)	48	38	35	35	19	25	14	12	3.1 to 12
Add time, microseconds (30-bit binary fields)	46	38	35	35	19	24	14	12	3.1 to 12
Max. no. of index registers	15	15*	15*	15*	15*	15*	15*	15*	94
Processor features:									
Advanced Programming	opt.	std.	std.	std.	std.	std.	std.	std.	std.
Edit Instruction	opt.	std.	std.	std.	std.	std.	std.	std.	std.
Multiply & Divide	std.	std.	std.	std.	std.	std.	std.	std.	std.
Scientific Instructions	no	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.
Storage Protection	no	std.	opt.	opt.	std.	opt.	std.	opt.	std.
Extended Multiprog'g.	no	std.	opt.	opt.	std.	opt.	std.	opt.	—
8-Bit Transfer	no	std.	opt.	opt.	std.	opt.	std.	opt.	—
CHANNELS									
No. of I/O Channels	3 or 4	12	4	6	12	4 or 8	16	6 or 16	32 or 48
Max. no of peripheral controls	16	32	16	32	32	32	48	96	96
Max. no. of simultaneous I/O operations	4	8	4	6	12	8	16	16	34

*15 index registers for each program in a multiprogramming environment.

▷ processors make extensive use of monolithic integrated circuits. In addition, the Series 200 further enhanced the product line by adding a front-end communications processor, a CRT display console, and the powerful OS/2000 operating system.

Series 2000 users can take full advantage of the extensive array of software facilities that Honeywell has developed for the Series 200 line. Most significantly, Honeywell offers the industry's broadest assortment of application packages, with strong emphasis on general accounting, manufacturing, retailing, distribution banking, insurance, hospitals, education, and government.

In addition, the Series 2000 processors can utilize all of the Series 200 peripheral equipment. Thus, the Series 2000 buyer can choose from one of the industry's broadest lines of input/output equipment, mass storage units, operating systems, compilers, and application programs.

Series 2000 computer systems span a broad range of rental prices, from just over \$2,000 to more than \$50,000 per month. Customer deliveries of the Models 2040, 2050, 2060, and 2070, began in April and May 1972.

▶ **STORAGE PROTECTION:** The Storage Protection feature, for Models 1015 and above in the Series 200 and Models 2030 and above in the Series 2000, shields a programmer-specified memory area against unintentional overwriting by any program operating in the standard (non-interrupt) mode.

CENTRAL PROCESSORS (SERIES 200)

INDEX REGISTERS: See table for the maximum number of index registers available in each model. Any 3- or 4-character memory address can be modified by indexing.

INDIRECT ADDRESSING: Possible through any number of levels for 3- or 4-character memory addresses.

INSTRUCTION REPERTOIRE: A basic set of 28 instructions, included in all Series 200 processor models, provides facilities for decimal and binary addition and subtraction, logical and control functions, and input/output control. Decimal multiply and divide instructions are standard in Models 200 and above, as well as in Model 115/2, but are not available for the smaller processors.

The Advanced Programming and Edit Instruction features, standard in some models and optional in others (see table), provide a total of 9 additional instructions which significantly increase the processing power and flexibility. The Advanced Programming feature also provides cap-

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CHARACTERISTICS OF THE SERIES 2000 PROCESSOR MODELS

	Model 2020	Model 2030	Model 2030A			Model 2040	Model 2040A		
			Basic	With First Power Module	With Second Power Module		Basic	With First Power Module	With Second Power Module
DATE INTRODUCED	Dec. 1972	Dec. 1972	Feb. 1973	Feb. 1973	Feb. 1973	Jan. 1972	Sept. 1972	Sept. 1972	Sept. 1972
MAIN STORAGE									
Cycle time, microseconds	2.75 or 2.50	2.0	2.0	2.0	1.6	1.6	3.0	2.0	1.0
Chars. fetched per cycle	1	1	1	1	1	1	2	2	2
Minimum capacity, chars.	24,576	40,960	40,960	40,960	40,960	49,152	65,536	65,536	65,536
Maximum capacity, chars.	65,536	98,304	196,608	196,608	196,608	131,072	524,288	524,288	524,288
PROCESSOR									
Processor type no.	2021	2032				2041			
Control memory read/write time, nanoseconds	500	500	500	500	500	250	250	250	250
Instruction times, microseconds:									
Decimal add/subtract (5 digits)	†	47.5	47.5	47.5	38.0	38.0	35.0	21.0	14.0
Decimal multiply (5 digits)	†	431.9	431.9	431.9	345.5	345.5	228.0	137.0	91.0
Decimal divide (5 digits)	†	†	†	†	†	1080.5	715.0	429.0	286.0
Binary add/subtract (30 bits)	†	47.5	47.5	47.5	38.0	38.0	42.0	28.0	14.0
Move (5 characters)	†	36.9	36.9	36.9	29.5	29.5	28.0	17.0	11.0
Compare (5 characters)	†	39.4	39.4	39.4	31.5	31.5	35.0	21.0	14.0
Floating add/subtract	†	*	*	*	*	*	*	*	*
Floating multiply	†	*	*	*	*	*	*	*	*
Floating divide	†	*	*	*	*	*	*	*	*
Additional time for indexing	†	†	†	†	†	5 to 10	†	†	†
Processor features:									
Advanced Programming	std.	std.	std.	std.	std.	std.	std.	std.	std.
Edit Instruction	std.	std.	std.	std.	std.	std.	std.	std.	std.
Multiply & Divide	opt.	std.	std.	std.	std.	std.	std.	std.	std.
Scientific Instructions	no	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.
Storage Protection	no	std.	std.	std.	std.	std.	std.	std.	std.
Extended Multiprogramming	no	std.	std.	std.	std.	std.	std.	std.	std.
8-Bit Transfer	opt.	std.	std.	std.	std.	std.	std.	std.	std.
CHANNELS									
No. of I/O sectors	1	1	1	2	1	2	2	2	3
No. of I/O channels	3 or 4	6	6	12	6	12	8	12	16
Max. no. of peripheral controls	16**	16**	16**	32**	16**	32**	32	32**	48**
Max. no. of simultaneous I/O operations	4	6	6	8	6	8	8	12	16
Max. total I/O data transfer rate, char/sec.	500,000	500,000	500,000	667,000	500,000	667,000	1,000,000	1,000,000	1,500,000
CRT CONSOLE	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.
PRIMARY SOFTWARE	Mod 1 (MSR)	MSR/2000, OS/2000	MSR/2000, OS/2000	MSR/2000, OS/2000	MSR/2000, OS/2000	OS/2000	OS/2000 or Mod 4	OS/2000 or Mod 4	OS/2000 or Mod 4

NOTE: See footnotes on next page.

▷ In September 1972, Honeywell announced a unique marketing strategy designed to encourage the purchase of Series 2000 systems, particularly among owners of mature Series 200 systems who might be tempted by the more technologically advanced products being offered by competitors. Two models of the Series 2000 product line, Model 2040A and Model 2050A, were offered as purchase-only systems at significantly reduced prices. Honeywell also eliminated one of the major drawbacks of purchased systems by providing facilities for later upgrading of these systems. Both the Model 2040A and 2050A (as well as the Model 2030A, which joined the purchase-only group in February 1973) can be upgraded at users' sites by the addition of "power modules" that can increase both the central processor cycle times and

▶ abilities for indexing, indirect addressing, and reverse reading of magnetic tape.

The Scientific Instructions feature, optional for Models 1015 and above, provides 14 instructions that handle floating-point arithmetic and decimal/binary conversions.

INSTRUCTION TIMES: See table: the times shown are for 2-address decimal and binary addition of 5-character fields, using the 3-character addressing mode.

OPTIONAL FEATURES: The Storage Protection, Advanced Programming, Edit Instruction, and Scientific Instructions features have been described above.

The Extended Multiprogramming feature, for Models 1015 and above, provides storage protection with base relocation, external interrupt masking, and instruction timeout (which

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CHARACTERISTICS OF THE SERIES 2000 PROCESSOR MODELS

	Model 2050	Model 2050A			Model 2060	Model 2070
		Basic	With First Power Module	With Second Power Module		
DATE INTRODUCED	Jan. 1972	Sept. 1972	Sept. 1972	Sept. 1972	Jan. 1972	Jan. 1972
MAIN STORAGE						
Ccycle time, microseconds	1.6	2.5	2.0	1.0	1.14	1.0
Chars. fetched per cycle	2	4	4	4	2	4
Minimum capacity, chars.	98,304	131,072	131,072	131,072	131,072	131,072
Maximum capacity, chars.	262,144	1,048,576	1,048,576	1,048,576	524,288	1,048,576
PROCESSOR						
Processor type no.	2051C				2061	2071
Control memory read/write time, nanoseconds	250	250	250	250	250	250
Instruction times, microseconds:						
Decimal add/subtract (5 digits)	22	27	18	9	16	9
Decimal multiply (5 digits)	146	168	112	56	104	56
Decimal divide (5 digits)	458	564	376	188	326	188
Binary add/subtract (30 bits)	22	27	18	9	16	9
Move (5 characters)	18	14	11	7	13	7
Compare (5 characters)	22	16	12	8	16	8
Floating add/subtract***	*	16	12	8	*	8
Floating multiply***	*	30	23	15	*	15
Floating divide***	*	36	27	18	*	18
Additional time for indexing	3 to 7	7.9 to 12.9	6.3 to 10.3	3.17 to 5.16	3.6 to 5.9	3.17 to 5.16
Processor features:						
Advanced Programming	std.	std.	std.	std.	std.	std.
Edit Instruction	std.	std.	std.	std.	std.	std.
Multiply & Divide	std.	std.	std.	std.	std.	std.
Scientific Instructions	opt.	opt.	opt.	opt.	opt.	std.
Storage Protection	std.	std.	std.	std.	std.	std.
Extended Multiprogramming	std.	std.	std.	std.	std.	std.
8-Bit Transfer	std.	std.	std.	std.	std.	std.
CHANNELS						
No. of I/O sectors	2	2	3	5	3	5
No. of I/O channels	12	12	16	16	16	16
Max. no. of peripheral controls	32	32	48	80	48	80
Max. no. of simultaneous I/O operations	12	12	16	16	16	16
Max. total I/O data transfer rate, char./sec.	1,000,000	1,000,000	1,500,000	2,500,000	1,500,000	2,500,000
CRT CONSOLE	opt.	opt.	opt.	opt.	opt.	std.
PRIMARY SOFTWARE	OS/2000 or Mod 4	OS/2000 or Mod 4	OS/2000 or Mod 4	OS/2000 or Mod 4	OS/2000 or Mod 4	OS/2000 or Mod 4

* Requires optional Scientific Unit; time not specified to date.

** Processor includes integrated controls for card reader, punch, and printer.

*** Accumulator to accumulator.

† Instruction execution times not specified to date.

▷ input/output capabilities. Incremental memory modules are also available for all three purchase-only systems. In addition, Honeywell offered a variable trade-in allowance on purchased Series 200 systems toward the purchase of the Series 2000A models, which should make them even more attractive to Series 200 owners who have not yet fully depreciated their systems.

▶ permits a time limit to be placed on the execution of any one instruction).

The 8-Bit Transfer capability, standard in some models and optional in others (see table), permits both data and punctuation bits to be transferred between core storage and certain peripheral control units. (In the normal 6-bit mode, only the 6 data bits of each character are transferred.)

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▷ In January 1974, Honeywell extended the concept of the upgradable processor by making the Model 2030A and Model 2040A available to rental customers as well as purchase customers.

SERIES 200 PROCESSORS

The characteristics and orientation of the current Series 200 and 2000 processor models are summarized in the following paragraphs and in the accompanying tables. It should be noted that nearly all of Honeywell's marketing emphasis in the medium-scale class has now shifted from the Series 200 to the Series 2000 computers, which deliver significantly more performance per dollar than the earlier models. Many of the older models are no longer in production and are now offered only on an "as available" basis.

Model 105, introduced in July 1971, is the lowest-priced model in the extensive Series 200 line. In both price and performance, the Model 105 is directly competitive with the IBM System/3 Model 10 and the NCR Century 50. Thus, it filled a significant gap in the Honeywell product line and has attracted numerous tab users—as well as System/360 Model 20 computer users—into the Honeywell camp. To increase the Model 105's attractiveness to IBM 360/20 users, Honeywell concurrently announced a Report Program Generator that runs under its Mod 1 (MSR) Operating System, and a conversion aid, *Liberator/20*, that facilitates program conversions from 320/20 RPG to the new Honeywell RPG language.

Model 105 has a cycle time of 3.5 microseconds per character and offers core storage capacities of 16,384, 24,576, or 32,768 characters. Two read/write channels are standard and a third is optional, permitting up to three I/O operations to occur simultaneously with computing. Integrated control units for a card reader, punch, printer, and up to four disk drives are standard. Model 105 uses the Type 170-2 or 173-2 Disk Subsystem and can have up to 36.8 million characters of on-line storage in interchangeable disk packs. An entry-level Model 105 system consists of a 16K central processor, 400-cpm card reader, 300-lpm printer, and 9.2 million characters of disk pack storage on two spindles.

Models 110, 110-2, and 110-3, introduced in 1968, offered the advantages of COBOL programming and magnetic tape or disk files at a considerably lower price than any previously available Honeywell computer. All three models include integrated control units for a 300- or 650-lpm printer, 400- or 600-cpm card reader, and 100-to-500-cpm punch.

Model 115, introduced in March 1970, is a disk-oriented system that delivers processing speeds between those of the earlier Models 120 and 125 at a price below that of Model 110. Introduction of the Model 115 greatly improved Honeywell's competitive position against ▷

▶ The Type 213-3 Interval Timer initiates program interrupts at program-specified intervals.

The Type 213-4 Time of Day Clock enables a program to determine the current time in hours, minutes, seconds, and tenths of seconds.

The High Resolution Clock is included in Series 200 Models 2015, 3200 and 4200. It is used in job accounting performed by the OS/2000 operating system to measure central processing time used by a job.

INPUT/OUTPUT CONTROL (SERIES 200)

I/O CHANNELS: Every Series 200 processor includes from 1 to 48 program-assignable I/O channels (see table).

CONFIGURATION RULES: The table shows the maximum number of peripheral controls that can be connected to each Series 200 processor. The exact number of controls that can be accommodated varies according to their specific power and address requirements.

There are no other noteworthy limitations upon the configuration possibilities for Models 200 and above. However, the smaller processor models include integrated controls for certain basic peripheral devices and impose limits upon the other devices that can be connected, as explained in the following paragraphs.

The Model 105 Processor includes integrated controls for the Type 170-2 or 173-2 Disk Subsystem, the 300-lpm Type 112 Printer, and either the Type 214-2 Card Reader/Punch (400/100-400 cpm) or the Type 123 Card Reader (400 cpm) and the Type 214-1 Card Punch (100-400 cpm). Other I/O devices that can be connected to a Model 105 are the Type 220-1 Console, Type 232-5 MICR Reader-Sorter (550 dpm), Type 209 Paper Tape Reader, Type 210 Paper Tape Punch, Type 281 Single-Channel Communication Control, and a maximum of two Type 204B-23/24 Magnetic Tape Units (8.9KC) connected via the Type 103G Tape Control.

The Model 110, 110-2, and 110-3 Processors include integrated controls for the Type 112 or 122-3 Printer and either the Type 214-2 Card Reader/Punch or the Type 214-1 Card Punch and the Type 123 or 123-2 Card Reader. The Model 110 Processor can also accommodate either up to two Disk Pack Drives (Type 171 or 258B) or up to two Magnetic Tape Units (Type 204B-11B/12B, 204B-13/14, 204B-17, or 204B-21/22), connected via the appropriate control units. The Model 110-2 Processor contains an integrated disk control for one or two Type 155 Disk Pack Drives only. The Model 110-3 Processor contains an integrated control for up to four disk spindles, which may be Type 155, 258B, or 259B Disk Pack Drives in any combination. In addition, any two of the following devices can be connected to a Model 110, 110-2, or 110-3 Processor: Type 209 or 209-2 Paper Tape Reader, Type 210 Paper Tape Punch, Type 232 MICR Reader-Sorter, Type 281 Single-Channel Communication Control, or Type 220-3 Console.

The Model 115 and 115/2 Processors include integrated controls for one Type 112, 122-3, 122-4, or 122-6 Printer and either one Type 214-2 Card Reader/Punch or one Type 123, 123-2, or 123-4 Card Reader and one Type 214-1 Card Punch. In addition, Model 115 contains an integrated control for up to two Type 155 Disk Pack Drives or four Type 171, 172, or 279 Disk Pack Drives; and Model 115/2 contains an integrated control for up to four type 172, 273, ▶

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▷ systems such as the IBM 360/20 Submodel 5, the NCR Century 100, and the UNIVAC 9200 II. Standard equipment for the Model 115 Processor includes 16,384 characters of 2.75-microsecond core storage (expandable to 24,576 or 32,768 characters), a 500-nanosecond control memory, two read/write channels, and integrated peripheral controls for a printer, card I/O units, and up to four spindles of disk storage. A third read/write channel is optional. Software support is provided under either the Disk COBOL Programming System or the more comprehensive Mod 1 (MSR) Operating System.

Model 115/2, announced in January 1971, is a more powerful version of the Model 115 system with 22% higher internal speed and storage capacities of 32K, 49K, or 65K characters. Integrated control units for a card reader, punch, printer, and up to eight disk drives are standard. With monthly system rentals in the \$4,000 to \$8,000 range, the 115/2 was designed to compete against (and hopefully replace) systems such as the IBM System/360 Model 25, the NCR Century 200, and the UNIVAC 9300. It can also serve as a suitable upgrade machine for Honeywell 115 and 120 users. Model 115/2 deliveries began almost immediately, in January 1971.

Models 120, (introduced in 1965) and *125* (introduced in 1967) provide slightly less processing power than the original Model 200, contain integrated controls for a card reader, punch, and printer, and can use nearly all of the Series 200 peripheral equipment. *Model 200*, the machine that made Honeywell a large and profitable computer supplier was eclipsed in price/performance by the newer Series 200 processors. *Models 1200, 1250, and 2200* were introduced between 1964 and 1967 to provide progressively increasing processing capabilities.

Models 1015 and 2015, introduced in January 1971, are medium-scale systems that offer substantially more performance per dollar than the older Series 200 processors—but less than the new Series 2000 models.

Model 1015 provides slightly slower internal processing speeds than the earlier Models 1200 and 1250, together with greatly increased I/O simultaneity, at a substantially lower price. With 12 I/O channels, Model 1015 can handle a total I/O throughput of up to 667,000 characters per second. Typical system rentals fall into the \$8,000 to \$18,000 range.

Model 2015 is a medium-scale system that provides roughly three-fourths of the processing and input/output power of the impressive Model 3200 system at a much lower price. Monthly rentals for typical Model 2015 systems range from about \$11,000 to \$25,000. The 2015 has two I/O sectors, one standard and one buffered, and can handle a total I/O throughput of up to 1,000,000 characters per second. The Model 2015 processor has a 125-nanosecond control memory. Special diagnostic instructions and a maintenance mode facilitate servicing. ▷

▶ or 279 Disk Pack Drives (or eight with an optional expansion feature). With appropriate control units, the following I/O devices can be connected to a Model 115 or 115/2 Processor: all Type 123 and 223 Card Readers, all Type 122 and 222 Printers, Type 209 and 209-2 Paper Tape Readers, Type 210 Paper Tape Punch, Type 220-1 and 220-3 Consoles, Type 232 MICR Reader-Sorter, and Type 281 and 286 Communication Controls. In addition, any of Honeywell's "simultaneous" magnetic tape units except Type 204D-5 can be connected, and so can the nonsimultaneous Type 204B-21/22 units. The use of magnetic tape requires one of the following Tape Controls: Type 103F, 203B-1, 203B-2, 203B-2A, 203B-3, 203B-6, 203C-7, 203D-1, or 203D-3.

The Model 120, 120-0, 120-3, 125, and 125-3 Processors all contain integrated controls for one Type 112, 122-3, 122-4, or 122-6 Printer and either one Type 214-2 Card Reader/Punch or one Type 123, 123-2, or 123-4 Card Reader and one Type 214-1 Card Punch. In addition, Models 120-3 and 125-3 include integrated disk controls that permit direct connection of the Type 155, 258B, or 259B Disk Pack Drives. Magnetic Tape Units with speeds ranging from 7.2KC to 149KC, as well as most other Series 200 I/O devices, can be connected via the appropriate control units. Magnetic tape, however, cannot be used with Models 120-3 and 125-3. When additional, non-integrated peripheral control units are connected to a Model 120, 120-0, or 120-3 Processor, the optional Series 200 Control Unit Adapter is required.

SIMULTANEOUS I/O OPERATIONS: In general, each channel can handle one input or output operation at a time. The table shows the maximum number of I/O operations that each processor can control concurrently with computing. (Optional features are required in some models to achieve these maximum capabilities.)

In Models 105 through 2200, the maximum data transfer rate for each I/O channel is either 83,300 or 167,000 characters per second, though higher data rates can be handled by interlocking two or more channels. Models 3200, 4200, and 8200 have "variable-speed" I/O channels capable of handling data rates of up to 500,000 characters per second.

CENTRAL PROCESSORS (SERIES 2000)

INDEX REGISTERS: There are 15 index registers, located in main storage, for each program in a multi-programming environment. Any 3- or 4-character memory address can be modified by indexing.

INDIRECT ADDRESSING: Possible through any number of levels for 3- or 4-character memory addresses.

INSTRUCTION REPERTOIRE: All of the Series 2000 processors have a basic set of 43 instructions, which provide facilities for decimal addition, subtraction, multiplication, and division; binary addition and subtraction; logical and control functions; and input/output control. The Scientific Unit, standard in Models 2070 and 2088 and optional in the smaller models, provides 14 additional instructions that handle floating-point arithmetic and decimal/binary conversions.

The following features, which were optional in most Series 200 processors, are standard in most Series 2000 models. The Advanced Programming and Edit Instruction features provide a total of 9 instructions which significantly increase the processing power and flexibility. The Advanced ▶

Honeywell Series 200 and 2000

➤ *Model 3200*, announced in April 1969, was the first really powerful medium-scale processor in the Series 200 line. It can control up to 16 simultaneous I/O operations, transfer up to 1.5 million characters of I/O data per second, and control the operation of up to 20 concurrent programs through the Mod 4 Operating System. A typical integrated-circuit chip used in the 3200 contains 34 logic gates and the equivalent of 92 transistors, 70 resistors, and 10 diodes.

Model 4200 is the largest purely character-oriented Series 200 processor. It was announced in 1965, though customer deliveries did not begin until early 1969 as a result of specification changes and other delays. The 4200 features a read-only memory for control of internal data movement and manipulation, a 125-nanosecond control memory containing 64 address registers, interleaved core storage (two-way in the 262K model and four-way in the 524K model), and special diagnostic instructions and a maintenance processor to facilitate servicing.

Model 8200 is designed to fill a unique dual role: it serves as the upper end of the Series 200 and also as a compatible third-generation system for users of the earlier Honeywell 800 and 1800 computers. To carry out this demanding assignment, the Model 8200 Processor combines five functional units: a word processing subsystem that is program-compatible with the 800/1800 systems, a variable-length-field (VLF) subsystem that is program-compatible with the smaller Series 200 models, a common memory subsystem, an input/output subsystem, and a master control facility that coordinates the operations of the other units.

The Model 8200 word processor executes about 300,000 three-address instructions per second on 48-bit binary or BCD operands. It provides hardware control over multi-programmed operation of up to eight concurrent programs through the use of eight independent groups of control registers. The VLF processor executes character oriented instructions in the same manner as the other Series 200 processors. Communication between the two processing subsystems and the other functional units is carried out by means of program interrupts and control instructions.

Introduced in 1965, the Model 8200 was not delivered to customers until May 1969. Its unusual architecture necessitated the development of a specialized set of software support facilities called the Mod 8 Operating System. Model 8200's sales appeal has been largely limited to current users of Honeywell 800 and 1800 systems. Since its character-mode processing speeds are about the same as those of Model 4200 while its price tag is far higher, Model 8200 has comparatively little appeal for most series 200 users.

SERIES 2000 PROCESSORS

Models 2020 and 2030, the smallest processor models in the Series 2000 computer line, were announced in ➤

➤ Programming feature also provides capabilities for indexing, indirect addressing, and reverse reading of magnetic tape. The extended Multiprogramming feature provides storage protection with base relocation, external interrupt masking, and instruction timeout (which permits a time limit to be placed on the execution of any one instruction); it is not available on the Model 2020 central processor. The 8-Bit Transfer capability permits both data and punctuation bits to be transferred between core storage and certain peripheral control units. (In the normal 6-bit mode, only the 6 data bits of each character are transferred.) The Multilevel Code-Handling facility permits automatic translation between character code of up to 12 levels.

INSTRUCTION TIMES: See table: the times shown are for 2-address decimal and binary addition of 5-character fields, using the 3-character addressing mode.

OPTIONAL FEATURES: The Scientific Unit, which is optional for Models 2030, 2040, 2050, and 2060, has been described above.

An Interval Timer, standard in all Series 2000 processors, initiates program interrupts at program-specified intervals.

The Type 213-4 Time of Day Clock enables a program to determine the current time in hours, minutes, seconds, and tenths of seconds.

The Job Accounting Timer/High Resolution Clock is available in Series 2000, Models 2040 and above. It is used by the OS/2000 operating system for job accounting.

INPUT/OUTPUT CONTROL (SERIES 2000)

I/O CHANNELS: The table shows the number of program-assignable I/O channels in each Series 2000 system.

CONFIGURATION RULES: The table shows the maximum number of peripheral controls that can be connected to each Series 2000 processor. The exact number of controls that can be accommodated varies according to their specific power and address requirements.

There are no other noteworthy limitations upon the configuration possibilities for the Series 2000 system. However, Models 2020, 2030, and 2040 include integrated controls for the Type 112, 122-3, 122-4, or 122-6 Printer and either the Type 214-2 Card Reader/Punch or the Type 123, 123-2, or 123-4 Card Reader and the Type 214-1 Card Punch.

A console is required on Model 2040 and larger Series 2000 processors. It can either be the Type 220-8 Visual Information Control Console or a Type 220-3, 220-6, or 220-6A.

SIMULTANEOUS I/O OPERATIONS: in general, each channel can handle one input or output operation at a time. The table shows the maximum number of I/O operations that each processor can control concurrently with computing, as well as the maximum total I/O data transfer rate it can accommodate. Each I/O channel has a data transfer capacity of 83,333 to 500,000 char/sec, depending upon the number of devices which are operating simultaneously.

MASS STORAGE

TYPE 155 DISK PACK DRIVE: A low-cost disk drive for use with the smaller Series 200 computers. Each Type 155 Drive has two functionally independent spindles, each ➤

Honeywell Series 200 and 2000



Smallest member of the Series 200/2000 family, the Model 105 system can be rented for less than \$2,000 per month. A Model 105 system can include up to 9.2 million characters of disk storage and can process programs written in COBOL, FORTRAN, and RPG.

- ▷ December 1972. In Honeywell's extensive current line-up of business-oriented computers, these two Models fit between the Model 58 and Model 2040. Models 2020 and 2030 offer internal processing power equivalent to that of the Series 200 Models 115 and 200, respectively, while offering increased main memory capacities, improved input/output capabilities, and considerably lower price tags. Rental prices begin at just over \$2,000 per month, placing these systems in direct competition with the IBM System/3, Burroughs B 1700, NCR Century 50, and UNIVAC 9200.

Models 2020 and 2030 are designed as disk-oriented systems, but they can also be equipped with 7-track and 9-track magnetic tape subsystems. Both processors contain integrated controls for a card reader, card punch, printer, and disk drives. They can accommodate most Series 200 and Series 2000 peripheral devices, including a 450-lpm printer.

The Model 2020 Processor contains 24,576 to 65,536 characters of core memory with a cycle time of 2.75 microseconds per 1-character access. An optional feature speeds up the cycle time to 2.5 microseconds for use with the Type 275 Disk Pack Drive. Three read/write channels are standard, and a fourth channel is available only for processors with more than 32K characters of main memory. The Model 2020 handles up to 4 simultaneous I/O operations and 16 peripheral address assignments. Advanced Programming and Financial Editing are standard features, and hardware multiply/divide is an optional feature for processors with more than 32K characters of Main memory. The Model 2020 is designed to utilize Honeywell's Mod 1 (MSR) operating system and can be programmed in COBOL, FORTRAN, RPG, or assembly language. Deliveries of the Model 2020 began in February 1973.

- ▷ capable of accepting a removable, single-disk Honeywell M-4010 Disk Pack with a maximum data capacity of 1.84 million characters. A maximum of two drives (four spindles) can be connected to the integrated disk control of a Model 110-2, 110-3, 115, 120-3, or 125-3 Processor; to a Type 157C Disk Control (used with a Model 120, 120-0, 123-0, or 125 Processor); or to a Type 257C Disk Control (used with a Model 200 or a 120-3 Processor). Each disk pack has two recording surfaces, and each surface contains 200 data tracks capable of holding up to 4602 characters each. Record lengths are variable. Average head movement time is 100 milliseconds, average rotational delay is 17.5 milliseconds, and data transfer rate is 147,500 characters per second.

TYPE 170-2 & 173-2 DISK SUBSYSTEMS: Provide up to 36.8 million characters of on-line storage for the low-cost Model 105 system only, using the 6-disk Honeywell M-4005 Disk Pack. The Type 170-2 Basic Disk Subsystem includes two disk drives and stores 4.6 million characters per drive; average head movement time is 120 milliseconds, or 80 milliseconds if the Disk Access Time Speedup feature is installed on each drive. As an alternative to the Type 170-2, the Model 105 user can select the Type 173-2 Disk Subsystem, which includes two disk drives and stores 9.2 million characters per drive; average head movement time is 145 milliseconds, or 95 milliseconds with the Disk Access Time Speedup feature. One or two additional Type 173 Disk Drives with the same capacity and access time can be added to the Type 173-2 Disk Subsystem. Both the 170-2 and the 173-2 drives have an average rotational delay of 17.5 milliseconds and a data transfer rate of 147,500 char/sec.

TYPE 171 DISK PACK DRIVE: Provides interchangeable random-access storage for the smaller Series 200 computers, using the 6-disk Honeywell M-4005 Disk Pack. Each drive holds one pack and stores up to 4.6 million characters, using 100 data tracks on each of the 10 surfaces. Average head movement time is 80 milliseconds, average rotational delay is 17.5 milliseconds, and data transfer rate is 147,500 char/sec. A maximum of four Type 171 drives can be connected to the integrated disk control in a Model 115 Processor. The Type 157B Disk Control connects up to two Type 171 drives to a Model 110 Processor, and the Type 257B Disk Control connects up to four Type 171 drives to a Model 120, 120-0, 125, or 200 Processor.

TYPE 172 DISK PACK DRIVE: Provides interchangeable random-access storage for the Model 115, 115/2, 2020, 2030, and 3030A systems, using the 6-disk Honeywell M-4005 Disk Pack. Each drive holds one pack and stores up to 9.2 million characters, using 200 data tracks on each of the 10 surfaces. Average head movement time is 50 milliseconds, average rotational delay is 12.5 milliseconds, and data transfer rate is 208,300 char/sec. Type 172 drives are connected directly to the integrated disk control in a Model 115, 115/2, 2020, 2030, or 2030A Processor.

TYPE 258, 258B, 259, & 259B DISK PACK DRIVES: These four units provide interchangeable random-access storage using the Honeywell M-4005 Disk Pack, which is physically compatible with the 6-disk IBM 1316 Disk Pack. Each drive holds one disk pack at a time and has a comb-type access mechanism with one read/write head serving each of the 10 recording surfaces. Up to 46,020 characters (10 tracks) can be read or written at each position of the access mechanism.

Types 258 and 258B have 100 data tracks on each surface, for a total data capacity of 4.6 million characters per pack.

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▷ The Model 2030 Processor contains 40,960 to 98,304 characters of core memory with a cycle time of 2.0 microseconds per 1-character access. Six read/write channels are standard, enabling the Model 2030 to handle up to 6 simultaneous I/O operations and 16 peripheral address assignments. Advanced Programming, Financial Editing, and hardware multiply-divide are standard features. Model 2030 users have a choice of three operating systems: Mod 1 (MSR), MSR/2000, or the more powerful OS/2000 multiprogramming system. Programs can be written in COBOL, FORTRAN, RPG, or assembly language. Deliveries of the Model 2030 began in January 1973.

In February 1973, the *Model 2030A* Processor became the third purchase-only computer in the Series 2000 line. (It is now available on a rental basis as well.) In its basic form, the Model 2030A has processing facilities that are nearly identical with those of the Model 2030. However, it can be upgraded at the user's site by the installation of "power modules" that increase its internal processing speed and/or its input/output capabilities.

The Model 2030A Processor contains 40,960 to 196,608 characters of core memory with a cycle time of 2.0 microseconds per 1-character access. Power Module PM2A30 speeds up the cycle time to 1.6 microseconds. The basic input/output facilities consist of 1 unbuffered sector with 6 read/write channels and 32 peripheral address assignments. Power Module PM1A30 adds a second unbuffered I/O sector with 6 more channels. Model 2030A can handle up to 6 simultaneous operations and a total I/O throughout of 500,000 characters/second with the basic I/O facilities; with PM1A30 added, it can handle up to 8 simultaneous operations and 667,000 characters/second.

Standard features of the Model 2030A include Advanced Programming, Financial Editing, Multiprogramming, 8-Bit Code Handling, and Multiply/Divide Instructions. Options include a buffered adapter for Type 277 Disk Pack Drives, an OS/2000 Package (see price list), and a Scientific Unit that provides floating-point arithmetic instructions.

Primary software support for the Model 2030A is provided by the dual-job MSR/2000 Operating System, announced in July 1973 and supplied at no charge to purchasers of a Model 2030A system. More extensive multiprogramming capabilities are available to Model 2030 and 2030A users who upgrade to the OS/2000 Operating System.

A basic Model 2030A configuration, consisting of a 40K central processor, console, card reader/punch, 650-lpm printer, and 18.4 million characters of disk storage on two spindles, can be purchased for \$209,110. Deliveries began in April 1973.

Model 2040, introduced in January 1972, has essentially the same performance characteristics as the Model 1015 ▷

▶ Types 259 and 259B have 200 data tracks on each surface, for a total data capacity of 9.2 million characters per pack.

Average head movement time is 65 milliseconds in Types 258 and 258B, and 80 milliseconds in Types 259 and 259B. Average rotational delay is 12.5 milliseconds in Types 258 and 259, and 17.5 milliseconds in Types 258B and 259B. Data transfer rate is 208,333 char/sec in Types 258 and 259, and 147,500 char/sec in Types 258B and 259B.

The Type 257 or 260 Disk Control accommodates up to eight Type 258 or 259 Drives and can be used with the Model 120, 125, 200, all larger Series 200 processors and the Series 200 processors starting with the Model 2040. The Type 257B Control connects up to eight Type 258B or 259B Drives to a Model 120, 120-0, 125, 200, 1015, 1200, 1250, 2015, or 2200 Processor. Up to four Type 258B or 259B Drives can be connected directly to the integrated disk control in the Model 110-3, 120-3, or 125-3 Processor. The Type 157B Control connects up to two Type 258B Drives to a standard Model 110 Processor.

TYPE 273 DISK PACK DRIVE: Provides interchangeable random-access storage using the 11-disk Honeywell M-4007 Disk Pack. Each drive holds one disk pack at a time, and up to 92,040 characters (20 tracks) can be read or written at each position of the comb-type access mechanism. There are 200 data tracks on each of the 20 recording surfaces. Each track can hold up to 4602 characters in variable-length records, for a total data capacity of 18.4 million characters. Average head movement time is 50 milliseconds, average rotational delay is 12.5 milliseconds, and data transfer rate is 208,333 characters per second. A Type 257 or 260 Disk Control accommodates up to eight Type 273 Drives and can be used with Processor Models 125 and above and with Models 2020, 2030, and 2030A. Up to four Type 273 drives (or up to eight if the Disk Control Expansion feature is used) can be connected to the integrated disk control in a Model 115/2 Processor.

TYPE 274 DISK PACK DRIVES AND CONTROL: Provides fairly large-capacity random-access storage for Models 1015 and above in the Series 200 and all Models of the Series 2000 from the Model 2040 up. Consists of a control unit and eight functionally independent on-line disk drives, each with the same capacity and performance characteristics as the Type 273 Drive Described above. A ninth disk drive is provided as a spare. Total data capacity of the eight on-line disk packs is 147.2 million characters.

TYPE 275 DISK PACK DRIVE: A lower-priced and slightly slower version of the medium-capacity Type 273 and 274 drives. Currently usable only with the Series 2000 processors. Uses the 11-disk Honeywell Type M-4007 Disk Pack. Each drive holds one pack at a time, and up to 92,040 characters (20 tracks) can be read or written at each position of the comb-type access mechanism. There are 200 data tracks on each of the 20 recording surfaces. Each track can hold up to 4602 characters in variable-length records, for a total data capacity of 18.4 million characters per drive. Average head movement time is 57 milliseconds, average rotational delay is 12.5 milliseconds, and data transfer rate is 208,333 characters per second.

A minimum Type 275 Disk Subsystem consists of a control unit and two disk drives and stores 36.8 million characters. Up to six additional drives can be added for a maximum subsystem capacity of eight drives and 147.2 million characters. The Write Protect, Dynamic Disk Addressing, and Central Processor Finished features are optional. Type 275 deliveries began in April 1972. ▶

Honeywell Series 200 and 2000

➤ processor that Honeywell added to the Series 200 line a year earlier. But the 2040, unlike the 1015, is available with core storage capacities as low as 49K characters and includes integrated control units for a card reader, punch, and printer. What's more, Model 2040 is offered at rental prices from 9 to 18 percent lower and purchase prices from 29 to 34 percent lower than the corresponding Model 1015 mainframes. A basic Model 2040 disk configuration, consisting of 49K processor, console, card reader, punch, printer, and 36.8 million characters of disk storage on two drives, can be rented for approximately \$7,000 per month (or approximately \$6,200 under a 5-year lease) or purchased for \$220,000.

Model 2040A was added to the Series 2000 computer family in September 1972. Originally available on a purchase-only basis, it is now offered to rental customers as well. The basic Model 2040A offers processing similar to (but not identical with) the Model 2040, and, like the Model 2030A, can be upgraded at users' sites by the installation of "power modules." Memory modules can be added to provide up to 524,288 characters of main memory. Through the addition of power modules, the internal speed and I/O capabilities of the Model 2040A can be raised first to the level of a Model 2050 and finally to the level of the considerably more powerful Model 2060. Model 2040A users can select either the OS/2000 or Mod 4 Operating System. A minimum Model 2040A configuration consisting of a 65K processor, console, card reader/punch, 650-lpm printer, three tape drives, and 36.8 million characters of disk storage can be purchased for about \$335,000. Customer deliveries began immediately.

Models 2050, 2060, and 2070 have the same general characteristics as Model 2040 and offer steadily increasing performance—all at significantly lower prices than their Series 200 counterparts. Model 2070, whose performance exceeds that of the Series 200 Model 4200 despite a slower core cycle time, also offers the Visual Information Control Console and a unique memory purging capability as standard features. The latter capability enables the system operator to isolate any malfunctioning 65K core memory module for maintenance work without shutting down the entire system. The computer automatically consolidates the remaining memory modules and continues to function as if there were no physical gaps in its memory.

Model 2050A was made available on a purchase-only basis in September 1972. This processor can be equipped with power modules to increase its internal speed and its input/output capabilities, first to the level of the Model 2060, and finally to the level of the powerful Model 2070. The Model 2050A can use either OS/2000 or the Mod 4 Operating System. A Model 2050A system consisting of a 196K processor, console, card reader/punch, 1100-lpm printer, a five tape drives, and 128 million characters of disk storage can be purchased for about \$595,000. Customer deliveries began immediately.

➤ **TYPE 276 DISK PACK DRIVE:** Provides fairly large-capacity storage for Model 115 and 115/2 systems, using the 11-disk Honeywell M-4008 Disk Pack. Each drive stores up to 37.4 million characters, using 200 data tracks on each of the 20 recording surfaces. Average head movement time is 50 milliseconds, average rotational delay is 25 milliseconds, and data transfer rate is 208,300 char/sec. The minimum Type 276 subsystem consists of a control adapter and two drive units. Up to four drives can be connected to the integrated disk adapter of a Model 115 Processor, and up to eight drives to a Model 115/2.

TYPE 277 DISK PACK DRIVE: Provides large-capacity storage for Models 1015, 2015, 3200, 4200, and 8200, and for the Series 2000 processors beginning with Model 2030, using the 11-disk Honeywell M-4008 Disk Pack. Each drive stores up to 64 million characters. Average head movement time is 34 milliseconds, and average rotational delay is 12.5 milliseconds. The data transfer rate between the drives and the buffered disk control unit is 714,000 char/sec; the transfer rate between the control and memory is determined by the I/O channel used. A Type 277 subsystem consists of a control unit and from two to eight drives, providing from 128 million to 512 million characters of on-line storage. Type 277 deliveries began in December 1972.

TYPE 278 DISK PACK DRIVES AND CONTROL: A "double-density" version of the Type 274 unit described above, usable with Models 1015 and above and with all models of the Series 2000 beginning with Model 2040. Consists of a control unit and from five to nine disk drives, of which a maximum of eight can be used on-line at any one time. Each drive accommodates one 11-disk Honeywell M-4008 Disk Pack, which is physically compatible with the IBM 2316 Disk Pack. There are 200 data tracks on each of the 20 recording surfaces. Each track can hold up to 8760 characters in variable-length records, for a total on-line data capacity of 35.0 million characters per drive and 280 million per Type 278 unit. Average head movement time is 50 milliseconds, average rotational delay is 12.5 milliseconds, and data transfer rate is 416,000 characters per second.

TYPE 279 DISK PACK DRIVES AND CONTROL: A large-capacity high-performance disk subsystem for Model 2015, 3200, 4200, and 8200 system and for all Series 2000 systems beginning with the Model 2040. Directly competitive with the IBM 3330 Disk Storage, it is the largest and fastest of the Honeywell disk drives. A Type 279 subsystem consists of a control unit and from two to eight single-spindle disk drives. Each drive accommodates one 12-disk Honeywell M-4050 Disk Pack and stores up to 133.3 million 6-bit characters. Thus, the subsystem capacity can range from 266.6 million to 1.066 billion characters. There are 404 data tracks on each of the 19 recording surfaces, and each track can hold up to 17,370 characters in variable-length records. Average head movement time is 30 milliseconds, and average rotational delay is 8.3 milliseconds. Data transfer rate between the drives and the buffered disk control unit is 1,074,000 char/sec; the transfer rate between the control unit and memory is determined by the I/O channel used.

The Type 279 control unit includes error detection and data recovery techniques to help ensure the integrity of the recorded data. File protection is provided for three classes of recorded information and two types of writing. A track-linking record facility permits the reading or writing of records which extend from one track to another, and an extended-instruction facility makes it possible to transfer a series of records by means of a single computer instruction.

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➤ *Model 2088* featured two identical central processors, each of which was similar to the Series 200 Model 4200 processor. The two processors were designed to communicate with each other via programmed memory-to-memory transfers and to justly access data files in disk storage. Thus, one processor would handle real-time inquiries and other transactions from remote terminals while the other processor would handle batch processing of local jobs. No Model 2088 systems were sold, and the model is no longer available from Honeywell.

HARDWARE FEATURES

Designed to permit easy conversion from the IBM 1400 Series computers, the Series 200 and 2000 processors naturally resemble them in many ways. They use 6-bit characters for internal data representation, operate on variable-length data fields terminated by "punctuation" bits in core storage, use 2-address instructions of varying length, and can use implied addresses (or "chaining") to reduce both storage requirements and execution times in many situations. Their instruction repertoire and symbolic assembly language are very similar to those of the 1400 Series machines.

There are, however, some noteworthy differences between the Series 200 and IBM 1400 Series processors. The Honeywell machines use two punctuation bits rather than a single "word mark" bit with each character, thereby permitting more flexibility in data movement. The Honeywell processors use 2-, 3-, or 4-character binary (rather than decimal) memory addresses and include binary add and subtract instructions to manipulate them, thereby achieving greater addressing efficiency. Moreover, the Honeywell processors have "floating" input/output channels, any one of which can be assigned by the program to service any on-line peripheral device or controller. All Series 200/2000 processors have automatic program interrupt facilities.

All seven Series 2000 processors use the same instruction repertoire, data formats, and 6-bit internal code as their Series 200 counterparts.

The Series 200/2000 now includes an unusually broad array of peripheral units. Among them are some 20 mass storage devices, numerous 7- and 9-track tape drives, three 3/4-inch tape drives for compatibility with older Honeywell systems, five card readers, nine printers, three MICR reader-sorters, an optical document reader, and a variety of data communications equipment for both the central site and remote terminals.

SOFTWARE AND SUPPORT

Software support for the Series 200/2000 has been growing steadily in both quantity and quality. Though the individual software components tend to be relatively straightforward and easy to use, the overall lineup of Series 200/2000 software has become voluminous and challenging to understand, appraise, and maintain.

➤ Program compatibility is maintained with the earlier Series 200 disk pack drives. Type 279 deliveries began in the fourth quarter of 1972.

TYPE 261 & 262 DISK FILES: These units, no longer in widespread use, provide large-capacity random-access storage on non-interchangeable disks for Models 125 and above. Type 261 has 36 disks (64 data recording surfaces) and stores up to 150 million characters. Type 262 has 72 disks (128 data recording surfaces) and stores up to 300 million characters. In both models, the disks are equally divided between two side-by-side vertical spindles. Type 261 has one comb-type access mechanism, while Type 262 has two. Up to 1.18 million characters can be read or written at each position of each access mechanism. Each data surface has 256 tracks, and each track holds up to 9216 characters in variable-length records. Average head movement time is 78 milliseconds, and data transfer rate is 190,000 characters per second. A Type 260 Disk File Control can handle up to eight Type 261 or four Type 262 Disk Files.

TYPE 266 & 267 HIGH-SPEED DISK FILES: These units provide high-performance random-access storage for the larger Series 200 processors. Both models have fixed read/write heads and an average access time of 8.6 milliseconds. Type 266 stores up to 4.2 million characters and transfers data at 300,000 char/sec; Type 267 stores up to 4.2 million characters and transfers data at 1,200,000 char/sec. Each track holds up to 4200 characters in Type 266 and up to 16,425 characters in Type 267 (which reads and records four bits in parallel). Record lengths are variable. A Type 260-1 Disk Control connects up to four Type 266 Disk Files to Processor Models 1015 and above and to Series 2000 processors starting with Model 2040. A Type 260-2 Disk Control connects up to four Type 267 Disk Files to a Model 4200 or 8200 Processor only.

TYPE 270A RANDOM-ACCESS DRUM AND CONTROL: Provides fixed-head drum storage for Models 115, 115/2, 125, and above and for Series 2000 systems from the Model 2040 up. Each drum stores up to 2.62 million characters, and up to eight drums can be connected to a control unit. Each drum has 512 tracks, and each track holds forty 128-character records. Average access time is 27 milliseconds, and data transfer rate is 111,000 characters per second.

DUAL DISK ACCESS: The Dual Access Storage Handling (DASH/2000) capability allows two data transfer operations to take place simultaneously in a single Type 277 or 279 disk storage subsystem. DASH/2000 can be added to systems operating under OS/2000 without modification of existing programs. It provides buffered data transfer rates ranging from 167,000 to 500,000 characters/second, as well as error detection and correction facilities.

INPUT/OUTPUT UNITS

TYPE 204B MAGNETIC TAPE UNITS: These units, which record on 1/2-inch tape in the 7-track NRZI mode, are the tape drives used in most Series 200 systems. Numerous models are available, with the following tape speeds (in inches per second), recording densities (in bits per inch), and data transfer rates (in characters per second):

Types 204B-23 and -24: 16 ips; 556 bpi (200 or 800 bpi optional); 8896 char/sec at 556 bpi; usable only with Model 105.

Types 204B-17 and -18: 16 ips; 200/556 bpi; 3200 or 8896 char/sec; usable only with Model 110.

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▷ At present, for the Series 200/2000 Honeywell is supporting a total of eight operating systems, ranging from the Disk COBOL Programming System for entry-level business data processing configurations to the Mod 8 Operating System for the large-scale Model 8200 computer. The most comprehensive of these operating systems is OS/2000. Introduced with the Series 2000 computers in January 1971, OS/2000 is also usable on Series 200 Models 1015 through 4200. It controls concurrent job-stream processing in up to 10 dynamically assigned main storage partitions while maintaining compatibility with the earlier OS/200 and Mod 1 operating systems. OS/2000, in fact, replaced its predecessor, the OS/200 operating system.

Newest in the line-up of Honeywell operating systems is MSR/2000, announced in July 1973 and delivered late in 1973. A subset of OS/2000, MSR/2000 is designed to provide dual-job multiprogramming for Model 2030 and Model 2030A systems, thus bringing the capabilities of these systems in line with competitors such as the IBM System/3 Model 15. On a Model 2030 or Model 2030A with a minimum of 40,960 characters of main memory, MSR/2000 can perform concurrent batch processing of two job streams plus two additional media conversion operations.

Honeywell places a strong emphasis upon the use of the COBOL programming language, and efficient COBOL compilers are included with all of the Series 200 operating systems. Honeywell also offers Easycoder assemblers, FORTRAN compilers, report program generators, and a BASIC time-sharing system; but there is no Series 200/2000 compiler for ALGOL or PL/I.

The array of application packages available to Series 200/2000 users is the broadest offered by any computer manufacturer and has been a major factor in Honeywell's marketing success. Areas of particular concentration include general accounting, manufacturing, retailing distribution, banking, insurance, hospitals, education, and government. Although nearly all of Honeywell's early Series 200 software development work was for tape-oriented systems, the emphasis has now shifted strongly toward disk-oriented systems, and many of the application packages are now available in both tape and disk-oriented versions.

Honeywell has elected to remain a "bundled" computer vendor. Normal customer support, education, and most software are still included in the Series 200/2000 equipment rental or purchase prices. The only current exception to this policy is the low-cost Model 105 system, for which technical support in excess of 30 man-days and program testing time in excess of 32 hours are separately priced.

COMPATIBILITY

The Series 200/2000 compatibility situation warrants examination from four different viewpoints: ▷

▶ Types 204B-13 and -14: 24 ips; 200/800 or 556/800 bpi; 4800 to 19,200 char/sec.

Types 204B-11B and -12B: 26 ips; 200/556 bpi; 5200 or 14,400 char/sec.

Types 204B-1 and -2: 36 ips; 200/556 bpi; 7200 or 20,000 char/sec.

Types 204B-7: 36 ips; 200/800, 556/800, 556/1200, or 800/1200 bpi; 7200 to 43,200 char/sec.

Types 204B-15 and -16: 48 ips; 200/556 bpi; 9600 or 26,700 char/sec.

Types 204B-21 and -22: 60 ips; 200/556 bpi; 12,000 or 33,360 char/sec.

Types 204B-3 and -4: 80 ips; 200/556 bpi; 16,000 or 44,500 char/sec.

Type 204B-8: 80 ips; 200/800 or 556/800 bpi; 16,000 to 64,000 char/sec.

Type 204B-5: 120 ips; 200/556 bpi; 24,000 or 66,700 char/sec.

Type 204B-9: 120 ips; 200/800, 556/800, 556/1200, or 800/1200 bpi; 24,000 to 144,000 char/sec.

The data format is compatible with that of the IBM 729 and 7330 Magnetic Tape Units. Inter-record gaps may be either 0.75 inch long, as in the IBM units, or from 0.45 to 0.70 inch long (depending upon the model) for higher effective data rates. The ability to read tape backward is part of the Advanced Programming facility, which is standard in some processor models and optional in others (see table). Vacuum control is used to mount, drive, and stop the tape in all models. Read-after-write checking is performed, and both vertical and longitudinal parity are generated during recording and checked during reading. All of the tape units with a single-digit suffix permit simultaneous reading and writing. Those with a two-digit suffix are non-simultaneous.

Numerous tape controls are available to connect the various Type 204B tape units to the Series 200 and/or 2000 processors; they are listed in the Equipment Prices section. The Models 204B-3, -4, -5, -7, -8, and -9 Magnetic Tape Units are available for the Series 2000. The controls for the units with tape speeds of 36 inches per second and above can accommodate up to eight tape units. The controls for the slower tape units (which are used mainly with Models 105, 110, 120, and 125), as well as for the 60-ips Type 204B-21 and -22 units, accommodate up to four tape units.

TYPE 204B/200/300/400 MAGNETIC TAPE SUBSYSTEMS: These units record data on 1/2-inch tape in the 7-track NRZI mode at a density of 556 bpi (200 bpi can be specified as an option). Tape speeds and data transfer rates (in characters per second) are as follows:

Type 204B/200: 18 ips; 10,000 or 3,600 char/sec.

Type 204B/300: 36 ips; 20,000 or 7,200 char/sec.

Type 204B/400: 54 ips; 30,000 or 10,800 char/sec.

The data format is compatible with that of the IBM 729, 7330, and 2401 Model 8 Magnetic Tape Units. Inter-record gaps may be either 0.75 inch long, as in the IBM units, or ▶

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- • Compatibility within the Series 200 and Series 2000 families.
- Compatibility with the IBM 1400 Series.
- Compatibility with older Honeywell computers.
- Compatibility with the IBM System/360 and System/370.

There is a high degree of upward compatibility among all the character-oriented Series 200 and Series 2000 processors. All models use essentially the same data formats, instructions, peripheral devices, and programming languages. There are, however, potential incompatibilities in the index registers (different Series 200/2000 processors can have 0, 6, 15, or more registers), in the addressing methods (different models can use 2-, 3-, and/or 4-character addresses), in the instruction sets (certain instructions are standard in some models, optional in others, and not available at all in still others), and in the software (not all of the operating systems are uniform with respect to job control language, assembler directives, compiler facilities, etc.). A user contemplating an upward or downward move within the Series 200/2000 family should carefully consider each of these potential trouble spots.

Compatibility with the IBM/1400 Series has, of course, been a key factor in the success of the Series 200. The principal software components in Honeywell's "Liberator" approach are the Easytran translators, which convert Autocoder source programs written for the IBM machines into Easycoder source programs which can be assembled and run on Series 200/2000 systems, usually with little or no need for manual alterations. The Easytran routines have effectively overcome the minor differences between the instruction sets and assembly languages of the two systems in literally hundreds of installations.

Series 200/2000 compatibility with earlier Honeywell computers is quite limited. The word processing system of the Model 8200 is program-compatible with the Honeywell 800 and 1800 computers (except that the 800/1800 I/O instructions are "trapped" and their functions are simulated by Model 8200 software). There is no direct program compatibility between the Series 200 and the second-generation Honeywell 400 and 1400 systems, although an assembly-language translator is available to aid in conversions. Three 3/4-inch magnetic tape drives are available for the Series 200 to provide data compatibility with all four of the earlier Honeywell systems.

The Series 200/2000 offers no direct program compatibility with the IBM System/360 and System/370 at the object-language level, and source-language compatibility is limited to programs coded in American National Standard COBOL or FORTRAN. The Honeywell 7-track and ➤

- 0.45 inch long for higher effective data rates. Programmed operations include the ability to read forward, read backward, write forward, and backspace or space forward on record. Vacuum control is used to mount, drive, and stop all models. Read-after-write checking is performed, and both vertical and longitudinal parity are generated during recording and checked during reading.

Each basic subsystem consists of a tape control, an electronics module, and three tape units. One additional tape unit can be added to the basic subsystem to reach the maximum tape unit configuration. The electronics module contains all the read/write circuitry and associated electronics necessary to perform standard tape operations. The tape control permits one read operation concurrently with one write operation in a subsystem. The Type 204B/200/300/400 Magnetic Tape Subsystems are available for the Model 2020, 2030, and 2030A Central Processors.

TYPE 204C-13 & -14 MAGNETIC TAPE UNITS: These units record data in the IBM-compatible 9-track NRZI mode at 800 bpi only. Tape speed is 36 ips and data transfer rate is 28,800 frames (or 38,400 6-bit characters) per second. A 203C-7 Tape Control connects a maximum of two drives, one Type 204C-13 and one Type 204C-14, to a Series 200 processor, Model 115 or above.

TYPE 204D and 204F MAGNETIC TAPE UNITS: These six units record data on 1/2-inch tape in the 9-track mode used by the IBM 2400 Series Magnetic Tape Units. They offer a choice of two densities: 800 bpi in NRZI mode or 1600 bpi in phase-encoded mode. Data is recorded in the form of four 6-bit Series 200 characters in each group of three consecutive "frames" on the tape. Optionally, data can be represented as one 8-bit character per frame. A read-write mode which translates one 8-bit frame to two Series 200/2000 characters is available for in-memory translation. Most commonly, EBCDIC tape data (one 8-bit EBCDIC character per frame) is processed by the optional hardware translator and converted to Series 200/2000 code, and vice versa. Vacuum control is used to mount, drive, and stop the tape. Up to eight of these units can be connected to a suitable Series 200/2000 tape control, which permits simultaneous reading and writing. Performance characteristics of the three models are as follows:

Type 204D-1: 36 ips; 800/1600 bpi; 38,400 or 76,800 char/sec.

Type 204D-3: 72 ips; 800/1600 bpi; 76,800 or 153,600 char/sec.

Type 204D-5: 105 ips; 800/1600 bpi; 112,000 or 224,000 char/sec.

Type 204F-1: 35 ips; 800/1600 bpi; 37,300 or 74,600 char/sec.

Type 204F-3: 70 ips; 800/1600 bpi; 74,600 or 149,300 char/sec.

Type 204F-5: 105 ips; 800/1600 bpi; 112,000 or 224,000 char/sec.

TYPE 204A MAGNETIC TAPE UNITS: These three units use 3/4-inch-wide tape and are offered mainly to provide tape compatibility with the earlier Honeywell 400, 1400, 800, and 1800 systems. Vacuum control is used to mount, drive, and stop the tape. Up to four of these drives can be connected to a suitable tape control, though only one of the drives can read or write data at a time. A combined ➤

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▷ 9-track magnetic tape units, however, are compatible with the corresponding IBM units. Although the Honeywell 6-disk M-4005 and 11-disk M-4008 Disk Packs are physically compatible with the IBM 1316 and 2316 Disk Packs, differences in data recording formats between the Honeywell and IBM disk drives preclude data exchanges via the disk pack medium. An RPG-to-COBOL Translator and an RPG Compiler are available to aid System/360 Model 20 installations in converting to the Series 200.

COMPETITIVE POSITION

For Honeywell Series 200 users, the Series 2000 clearly offers attractive possibilities for upgrading performance at a modest cost and with little or no conversion difficulty.

Users of IBM and other competitive equipment may tend to regard the Series 2000 systems as "old fashioned" because of their strong resemblance, in data formats and instruction repertoire, to the second-generation IBM 1400 Series computers. But performance per dollar is what really counts, and users who are considering an upgrade to an IBM System/370 or some other medium-scale computer should keep these points in mind:

- In price and performance, Honeywell's Model 2050 and Model 2070 are directly competitive with the IBM System/370 Model 135 and Model 145, respectively, while the Models 2020 and 2030 offer attractive upgrade possibilities to IBM System/360 Model 20 and small System/3 users. The other Series 2000 models add up to a wider range of choices for the user than any competitive medium-scale computer line currently offers.
- Honeywell has elected to remain a "bundled" computer vendor, so normal customer support, education, and software are still included in the Series 2000 equipment rental or purchase prices.
- Honeywell's 3-year and 5-year leases offer additional cost savings of about 9 and 13.5 percent, respectively, to users who can foresee their equipment needs for several years.
- Honeywell's persistent efforts to expand and improve the Series 200 product line have resulted in the availability of an unusually broad array of peripheral equipment and software, all of which is available to Series 2000 users.
- The Series 2000A models offer unique flexibility for both purchase and rental customers to selectively upgrade their computer systems through a combination of central processor enhancements, additional input/output capabilities, and memory size increases.
- The DATANET 2000 Communications Processor, together with the earlier Series 200 communications

▶ hardware/software system called "Orthotronic Control" provides for detection and correction of many errors. Performance characteristics of the three models are as follows:

Type 204A-1: 60 ips; 533 bpi; 32,000 char/sec.

Type 204A-2: 120 ips; 533 bpi; 64,000 char/sec.

Type 204A-3: 120 ips; 740 bpi; 88,800 char/sec.

CARD READERS: Five different models of 80-column card readers are offered, with the following rated speeds:

Type 123: 400 cpm.

Type 123-2: 600 cpm.

Type 123-4: 1050 cpm.

Type 223: 800 cpm.

Type 223-2: 1050 cpm.

Types 123, 123-2, and 123-4 use the integrated card reader control units contained in the smaller Series 200 processors, Models 105 through 125. Types 223 and 223-2 include control units and are used mainly with the larger Series 200 processors and Series 2000 systems. All models read cards on demand, in column-by-column fashion, and all have a 3000-card input hopper and one 2500-card stacker. Error cards can be offset-stacked under program control. An optional feature enables all models to read 51-column cards. Type 223 can also be equipped to read 90-column cards. These readers occupy the central processor for a maximum of less than 1% of each card cycle.

TYPE 214-1 CARD PUNCH: Punches 80-column cards at 100 to 400 cpm, depending on the position of the last column punched. Has a 1200-card input hopper and one 1300-card stacker. Cards which fail a punch-activation check can be offset-stacked. Uses either the integrated control unit in the Model 105 through 125 Processors or a separate type 208-1 Control for Series 200 and Series 2000 processors.

TYPE 209 & 209-2 PAPER TAPE READERS: Read 5- to 8-track punched tape at up to 600 char/sec. Include tape supply and take-up reels. Character parity can be checked by the program. A control unit is included.

TYPE 210 PAPER TAPE PUNCH: Punches 5- to 8-track tape at up to 120 char/sec. Character parity can be generated by the program. A control unit is included.

PRINTERS: Honeywell offers numerous models of drum-type line printers with the following rated speeds:

Type 112: 300 lpm

Type 112-2A: 450 lpm

Type 122-3: 650 lpm

Type 122-4: 950 or 633 lpm (via manual switch)

Type 122-6: 1100 or 734 lpm (via manual switch)

Type 222-2NA: 450 lpm

Type 222-3: 650 lpm

Type 222-4: 950 or 633 lpm (via manual switch)

Type 222-6: 1100 or 734 lpm (via manual switch)

Type 222-7: 300 lpm

Types 112, 122-3, 122-4, and 122-6 use the integrated printer control units contained in the smaller Series 200 processors, Models 105 through 125, and in Series 2000 Models 2020, 2030, 2030A, and 2040. The Type 222 Printers include control units and are used mainly with the larger Series 200 and Series 2000 Processors. Type 112-2A uses the integrated printer control units contained in the

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The Series 200/2000 product line includes an unusually wide choice of disk pack drives and magnetic tape units.

- ▷ controllers and terminals, gives Honeywell strong capabilities in the data communications area.
- Honeywell's large complement of application packages can significantly reduce the user's programming task for many common applications.

Thus, despite the absence of any dramatic advances in hardware or software technology, the Series 2000 systems still offer some noteworthy strengths to users of small to medium-scale computers. At the same time, it seems clear that the System 200/2000 line is nearing the end of its long and illustrious marketing life, and that Honeywell can soon be expected to announce its long-awaited new computer product line.

USER REACTION

Datapro interviewed 20 users of Honeywell Series 200/2000 computer systems. The users were selected randomly, except that an attempt was made to include roughly equal representation of both Series 200 and Series 2000 systems. Thus, 11 of the Honeywell customers interviewed were Series 200 users and 9 were Honeywell customers who had upgraded to Series 2000 central processors. Honeywell systems represented in the survey included Models 105 through 4200 in the Series 200 and Models 2020, 2040, 2050, and 2060 in the Series 2000. Since multiple-computer installations were encountered, a total of 22 Honeywell Series 200 and 2000 computer systems are represented in this survey.

- ▶ Model 2020 and 2030 processors. Type 222-2NA includes a control unit and is designed for use with central processors that do not have integrated printer controls.

All models have 63 printable characters and a choice of 120 or 132 print positions. Vertical spacing may be either 6 or 8 lines per inch. Skipping speed is a maximum of 20 inches/second in the 300-lpm models and 50 inches/second in the faster printers. The Numeric Print Feature, for Types 222-3 and 222-4 only, enables all-numeric lines to be printed at 1300 lpm in Type 222-3 or 1266 lpm in Type 222-4, while reducing the number of printable characters to 49. The standard printers occupy the central processor during from 2 to 31% of every print cycle, depending upon the specific processor and printer models. The optional Print Buffer, available for all the Type 222 Printers, reduces the processor demand to less than 1% of the print cycle in all cases.

TYPE 232 MICR READER-SORTER: Reads and sorts MICR-encoded documents at up to 600 per minute. Has 11 pockets. Also usable for off-line sorting.

TYPE 233-2 MICR CONTROL: Permits on-line use of a Burroughs B 103 MICR Reader-Sorter, which reads MICR-encoded documents at up to 1560 per minute.

TYPE 234 MICR READER-SORTER: Reads and sorts up to 830 MICR-encoded documents per minute. Has six standard pockets and one auxiliary pocket. Operates directly on-line to a Series 2000 Central Processor.

MICRCOM SUBSYSTEM: Designed to transmit processed data over communications lines from a branch or correspondent bank to a central computer facility. Consists of a central processor, a Type 234 MICR Reader-Sorter (above), a 400 cpm reader, a 300 lpm printer, one magnetic tape unit, and a 1,200 bps single-line communications controller. Optional equipment for expansion includes the Type 236 MICR Reader-Sorter, a 650 lpm printer, one additional magnetic tape unit, and communications controllers with speeds of up to 9,600 bps. The MICRCOM Subsystem can transmit data to a Honeywell Series 200, 2000, 400, 600 or 6000 computer system or to any computer that uses the binary synchronous mode for data transmission.

TYPE 236 MICR READER-SORTER: Reads and sorts up to 1,625 MICR-encoded documents per minute, in either on-line or off-line mode. A minimum of four pockets is available, expandable in four-pocket modules to a maximum of 32 pockets. Usable with all Series 200 and 2000 systems except Models 105, 110, and 8200.

TYPE 243 OPTICAL DOCUMENT READER: Optically reads numeric data printed in the OCR A font. Reads up to 70 characters from a single line on each document. Handles documents from 3 to 4 inches in height and 3.5 to 8 inches in length, at a speed of 600 to 1100 documents per minute. Transport speed is 100 inches/second, and documents are fed on demand. Has three stackers. Can also be equipped to read pencil-marked data from up to 12 vertical-mark positions per card.

TYPE 220-1 CONSOLE: Contains a 10-char/sec typewriter that can be used as a program-controlled I/O device or as a logging typewriter. Used in conjunction with the control panel that is built into the Series 200 processors.

TYPE 220-3 CONSOLE: Replaces the integrated control panel in the Series 200 and Series 2000 processors. Provides ▶

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▷ Of the 20 companies contacted, two had elected to convert to computer systems from other manufacturers rather than upgrade from the Series 200 to Series 2000 processors. The overwhelming majority — in fact, 17 of the 18 remaining users — described themselves as satisfied Honeywell customers.

Here's how the current Honeywell Series 200/2000 users rated their systems:

	Excellent	Good	Fair	Poor	Not Applicable
Ease of conversion	12	2	1	0	3
Reliability of mainframe	11	6	1	0	0
Reliability of peripherals	2	10	6	0	0
Maintenance service:					
Responsiveness	7	10	1	0	0
Effectiveness	3	7	7	1	0
Technical support	2	7	7	2	0
Software:					
Compilers	4	10	3	0	1
Operating system	8	9	1	0	0
Applications programs	0	1	3	0	14
Overall satisfaction	6	11	1	0	0

Some users were extremely satisfied with both the performance of their computer systems and the software and support services supplied by Honeywell. Other respondents, although rating their overall satisfaction as either Good or Excellent, indicated that there were areas in which they thought Honeywell's performance could be improved. Two of the most obvious categories were maintenance service and technical support for software. Users also complained that the software documentation was inaccurate and did not notify the user when changes had been made in the software. In terms of reliability, the central processors received extremely high marks, while some problems were reported with peripheral devices such as disk storage drives (the older Model 259 in particular), card readers, and printers.

Some of the users stated that they thought the Honeywell disk software should be improved; but, on the whole, software was rated as one of Honeywell's strong suits. Users reported that programming for the Honeywell systems is relatively easy and that the job control language for the operating systems is easy to use. OS/2000 users were particularly pleased with that operating system. They singled out its low main memory overhead, job scheduling and program cataloging facilities, and multi-programming capabilities as advantages. In the words of one Honeywell customer, "OS/2000 has DOS beat hands down."

Most of the Series 200/2000 users interviewed by Datapro were frank and realistic in their evaluation of their Honeywell systems. Because their systems are incompatible with the vast majority of byte-oriented systems in the marketplace, they pointed out that most software packages marketed by independent software vendors are not available for their systems.

▶ a 10-char/sec I/O typewriter and a control panel containing the switches and indicators required for processor control. This unit is required in every Model 1015 and is available with Model 2020, 2030, 2030A, and 2040 systems.

TYPE 220-6 CONSOLE: Has the same functions as the Type 220-3 Console, above. Required in every Model 2015 system; also usable in Model 3200 systems and Model 2040A, 2050, and 2060 systems.

TYPE 220-8 VISUAL INFORMATION CONTROL CONSOLE (VICC): The VICC is a system control center consisting of a CRT display, keyboard, and control panel housed in a free-standing, desk-like unit. Introduced with the Series 2000 processors in January 1972, the VICC is a standard feature in Model 2070 systems and optional for Models 2040, 2040A, 2050, 2050A, 2060, and the medium-scale Series 200 processors.

The VICC's 12-inch-diagonal display screen has a data capacity of 1920 characters in 24 lines of 80 characters each. Data input facilities consist of a typewriter-style alphanumeric keyboard and a separate numeric keypad. The control panel contains the switches and indicators required to operate the system. Data is transferred to and from the central processor at a speed of 600 characters per second, so the entire screen can be filled in less than 4 seconds.

The VICC can be expanded by adding a second display screen, a 40-char/sec serial printer, and/or a 23-inch remote display monitor. In a console with two display screens, one display can be used for interactive communications between the operator and the system while the other holds status displays showing job queues, memory utilization, etc. Software support for the VICC is provided under the OS/2000 and Mod 4 operating systems.

DATANET 2000 COMMUNICATIONS PROCESSOR: A minicomputer-based front-end communications processor designed for use in Series 200 and Series 2000 computer systems operating under OS/2000. Consists of a 16-bit minicomputer with 12,288 words (24K bytes) of core storage, an interface to the main computer, a network interface for 1 to 120 full-duplex communications lines, a real-time clock, and a control console with I/O typewriter and paper tape reader. The storage capacity can be expanded in 4096-word modules to a maximum of 32,768 words (65K bytes). The minicomputer has 75 basic instructions, an effective cycle time of 385 nanoseconds per byte, and an add time of 2.35 microseconds.

Programs stored in the DATANET 2000 poll the lines, translate ASCII code to or from the 6-bit Series 200/2000 internal code, queue messages in core or on an optional 512,000-byte fixed-head disk file, transfer data to or from the main processor, provide recovery and error handling, initialize and load the system, and permit operator intervention when necessary. Incoming messages are transferred into the minicomputer's A register, two bytes at a time, in codes of up to eight levels. Transmission can be either full-duplex or half-duplex, over either leased or switched lines, and in either synchronous or asynchronous mode. Line speeds of 45.5 to 10,800 bits per second can be handled. Cyclic redundancy checking is optional.

The basic DATANET 2000 handles up to 8 lines. Its capacity can be increased in 16-line increments to a maximum of 120 lines. Interface modules are available for a wide variety of communications devices and services, ▶

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➤ Among these 20 Honeywell customers, Datapro encountered only four who were making use of the many applications packages that Honeywell supplies for the Series 200 and Series 2000 systems. Although three of these users gave only Fair ratings to the Honeywell applications programs they were using, they emphasized that the availability of these programs is an asset, at the very least for providing a framework for their own programming efforts. (A Honeywell spokesman claimed that a considerably higher percentage of Series 200/2000 customers have installed Honeywell-supplied packages than was represented in this sample; he stated that most Honeywell customers are interested in the company's applications programs and that many use them regularly.)

In most cases the interviewed Series 200/2000 users were well aware that their equipment does not incorporate the latest state-of-the-art achievements in computer architecture and memory technology. But Honeywell's bundled status and attractive pricing policies, and the resulting cost/performance ratios attainable with the Series 200/2000 computer systems, were very attractive to them. So was the ability to upgrade into the Series 2000 without the necessity for onerous program and file conversions. Concern was expressed about the compatibility of the current Series 2000 family with any future Honeywell product line, echoing the profound distaste that most computer users have acquired for any time-consuming and disruptive conversion. As one Honeywell user candidly observed, "It all boils down to dollars . . .," and measured by that yardstick, the Honeywell Series 2000 still occupies a strong position in the computer marketplace. □

➤ including virtually any device that communicates in the ASCII or IBM BSC mode. First deliveries of the DATANET 2000 occurred in the fourth quarter of 1972.

TYPE 281 SINGLE-CHANNEL COMMUNICATION CONTROLS: These controls direct the transmission and reception of messages in 5- to 8-level codes at speeds ranging from 6 to 6250 characters per second. More than 20 different models of the Type 281 Control are offered to accommodate a wide range of terminal equipment and transmission facilities; see the Equipment Prices section for a complete list. Each control handles one line and operates in half-duplex fashion, sending and receiving either one character or a full message at a time under direct program control.

TYPE 286-1, -2, & -3 MULTI-CHANNEL COMMUNICATION CONTROLS: These three units direct the transmission and reception of message characters over a maximum of 3, 15, or 63 lines, respectively. The central processor is interrupted each time an individual character is transferred. Data rates of up to 300 characters per second can be handled on each line, but the maximum system throughput is limited to about 600 characters per second. One Type 285 Communication Adapter is required to form the appropriate interface between the Type 286 Control and each line. More than 30 different adapters are offered

to accommodate an unusually broad range of terminal equipment and transmission facilities.

TYPE 286-4 & -5 MESSAGE-MODE MULTI-CHANNEL COMMUNICATION CONTROLS: These two units direct the transmission and reception of whole messages over a maximum of 32 or 63 lines, respectively. Each character is transferred to or from a specified I/O area in main memory, and the processor is interrupted only after an entire message has been transferred. Data rates of up to 300 characters per second can be handled on each line, and the maximum system throughput is 7000 characters per second. One Type 285 Communication Adapter is required for each line, and more than 30 different adapters are available to accommodate an unusually broad range of terminal equipment and transmission facilities.

TYPE 286-6 & -7 MESSAGE-MODE MULTI-CHANNEL COMMUNICATION CONTROLS: These two units direct the transmission and reception of whole messages over a maximum of 32 or 63 lines, respectively, while maintaining compatibility with the IBM Binary Synchronous Communications (BSC) technique.

AUDIO RESPONSE SYSTEM: Provides computer-composed audio responses, in recorded human-voice form, to digital inquires from pushbutton telephones or other compatible devices capable of generating the required 2-out-of-8 multi-frequency tones. The principal system components are a Type 286 Multi-Channel Communication Control, a Type 285-8 Touch-Tone Adapter, a Type 285-8C, -8F, or -8J Audio Unit, and an 082-2 Voice Answer-Back Option for each pair of lines to be serviced. The basic Touch-Tone Adapter and Audio Unit can handle up to 6 lines; options permit control of up to 60 lines operating independently and simultaneously. Five different voice cylinders permit the user to choose a recorded vocabulary consisting of 31 words, 31 phrases, 63 words, 63 phrases, or 189 words.

TYPE 765, 775, & 785 VISUAL INFORMATION PROJECTION (VIP) SYSTEMS: These CRT display terminals, introduced in February 1971, are based on the widely used GE DATANET-760 terminals. They feature larger screens, faster response times, and larger display capacities than previous Honeywell CRT equipment. (The earlier, Bunker-Ramo-built Series 300 and 2300 VIP display units are now offered on an as-available basis.)

All three of these VIP systems have a 14-inch (diagonal) screen, a full alphanumeric keyboard, and a 63-character display set. Types 775 and 785 also have a numeric key-pad. Types 765 and 775 display up to 1012 characters of data in 22 lines of 46 characters each, while Type 785 display up to 2024 characters in 22 lines of 92 characters each. Type 765 transmits data asynchronously at 120 characters per second (1200 bps), while types 775 and 785 transmit synchronously at 250 or 300 characters per second (2000 or 2400 bps).

Types 765 and 775 are available in standard configurations of single or dual terminals or clusters of 3 to 20 terminals at a single location. Type 785 is a single-terminal display unit and control, with an optional interface that permits up to nine additional display units and their controls to be connected to a single line terminus. A Teletype Model 33 Receive-Only Printer can be used with Types 775 and 785, and a 23-inch receive-only CRT display can be used in place of a standard keyboard/display terminal in a Type 765 or 775 subsystem.

TYPE 7700 VISUAL INFORMATION PROJECTED (VIP) SUBSYSTEMS: These subsystems can be configured to

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► include multiple Keyboard Display Stations plus optional input-output devices, including magnetic tape cassette units and receive-only serial teleprinters.

The Type 770 Keyboard Display features a 12-inch CRT display screen, has a full alphanumeric keyboard plus a numeric pad, and a 63-character display set. Additional keys provide for tab, erase, insert, delete, transmit, complete cursor control, blink, a new blank option that inhibits display of private data fields, print, and read-write operations with the tape cassettes. The basic Keyboard Display Station can display up to 960 characters in 12 lines of 80 characters each. A Display Memory Expansion can increase the display memory from 12 to 22 or 24 lines; the screen format can be either 22 lines of 46 characters for a 1,012-character display, or 24 lines of 80 characters for a 1,920 character display. A forms mode of operation is standard and provides for forms display with fixed-protected fields and variable fields for data. The Type 7705 Keyboard Display Station provides an ASCII character set, and can display special symbols such as tilde, circumflex, braces, and brackets.

The optional Type 7701 Single Tape Cassette Unit provides the capability for the keyboard or host central processor to read or write from the display or the communications line. Tape speed is 7 inches per second and recording density is 800 bits per inch. Information is written to or read from the tape in display page increments. One display page is recorded on tape in data blocks with a control block. The tape may be searched for a specific display page by matching the first eight displayable characters of the recorded page to the eight characters beginning at the entry marker location. The Type 7702 Dual Tape Cassette Unit includes two tape cassette handlers and provides the capability to read from one cassette and write to the second cassette, although not simultaneously.

Either a Type 7713 or Type 7714 Receive-Only Printer can be attached to a Keyboard Display Station through a page print adapter. Control logic in the adapter permits printing to be directed by the central processor, the Keyboard Display Station, or the Tape Cassette Unit. The Type 7713 is an impact serial teleprinter with a friction-feed platen, 72 print positions, and a print speed of 10 characters per second. The Type 7714 is an impact serial teleprinter with a pin-feed platen, 118 print positions, and a print speed of 30 characters per second.

A 7700 VIP Subsystem consists of from 1 to 10 clustered Keyboard Display Stations with an optional interface that permits 10 additional display units to be connected to a single line terminus. Transmission is synchronous at speeds of 2000, 2400, or 4800 bits per second, and operation can be polled or non-polled.

TYPE 7500 MULTISTATION TERMINAL SYSTEM: The Type 7500 is an intelligent terminal that includes a programmable controller with from 4K to 16K bytes of memory, an alphanumeric keyboard and a numeric pad for data entry, a CRT display, and two digital cassette recorders for data storage. Optional peripheral equipment includes a 30-character-per-second serial printer and a 2.5-million-byte moving-head disk. The Honeywell Type 7500 Multistation Terminal System is based on the Datapoint 2200 Intelligent Display Terminal, which is described in detail in Report 70D-315-01.

Honeywell has developed EASAL (Easy Application Language), a COBOL-like language for programming the 7500 terminal. Full capabilities for string and file handling, arithmetic operations, and input/output control are

provided. EASAL 1 provides facilities for using the basic 7500 configuration, including a CRT display, a keyboard, and the dual cassette tape drives. EASAL 2 provides disk management instructions, and the EASYSHARE language provides additional instructions for station management in a multistation 7500 configuration. EASAL programs are executed under the Cassette Operating System.

SOFTWARE

OPERATING SYSTEMS: Software support for the Series 200 and Series 2000 computer lines is furnished at a number of distinct levels. Honeywell is currently supporting seven different operating systems: Disk CPS, Mod 1 TR, Mod 1 MSR, MSR/2000, OS/2000, Mod 4, and Mod 8. The facilities provided by each of these operating systems are summarized in the following paragraphs.

DISK COBOL PROGRAMMING SYSTEM: Disk CPS is a COBOL-oriented software system designed for small business data processing installations. It is used mainly with the small Model 105 and 115 Processors. Minimum equipment requirements are a 16K processor, two disk spindles (e.g., one dual-spindle Type 155 unit or two Type 172 drives), a 132-position line printer, a card reader or reader/punch, and the Advanced Programming and Edit Instruction features.

CPS consists of a group of routines that create and maintain a central data base, aid in program preparation, and simplify job control. The data base consists of data files and application library files (ALF). Each ALF contains application programs in executable form, utility programs needed to maintain the application's data files, descriptors of the data files to be processed in the application, and COBOL source-language versions of the application programs. Programs can be retrieved from an ALF and compiled and/or executed under the direction of a single job-control card. Up to six files can be handled simultaneously.

All programming under CPS is done in COBOL, using the COBOL C compiler. A group of utility programs handle functions such as sorting, merging, selecting, tabulating, reproducing, editing, updating, reporting, and data transcription.

MOD 1 OPERATING SYSTEM (TAPE RESIDENT): The Mod 1 (TR) system is designed for use on tape-oriented Series 200 systems with from 12K to 262K characters of core storage. At least 3 magnetic tape units are required, along with a printer, card reader, and the Advanced Programming feature. A Loader-Monitor routine searches for, loads, and starts programs which are stored on a binary run tape. Successive jobs can be executed in a stacked-job fashion without operator intervention. Multiprogramming is limited to the execution of up to 3 media conversion operations concurrently with one main program.

Mod 1 (TR) facilities include Easycoder Assemblers C and D, COBOL Compilers D and H, FORTRAN Compilers D and H, an RPG Compiler, and a broad range of input/output, data transcription, diagnostic, library, tape sort, and scientific routines.

MOD 1 OPERATING SYSTEM (MASS STORAGE RESIDENT): This disk-oriented version of the Mod 1 Operating System is designed for Series 200 and Series 2000 systems with from 16K to 262K characters of core storage. Also required are one or more mass storage devices, card reader, printer, and the Advanced Programming feature. Magnetic tape and communication devices are also supported. ►

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► All Mod 1 (MSR) operations are under the general control of a Supervisor routine, which handles job sequencing, program loading and initiation, and limited multi-programming. (An interrupt-driven foreground program can be run concurrently with stacked-job processing in a single background partition.) The Supervisor generally occupies from 1500 to 4000 core storage locations, depending upon the functions required. Data management facilities permit creation and maintenance of sequential, indexed sequential, partitioned sequential, and direct access (random) files. Macro routines for both logical and physical I/O control are also provided.

Mod 1 (MSR) facilities include MSR Assembler C, Mod 1 (MSR) COBOL, COBOL Compilers C, F, and I, FORTRAN Compiler F, communications I/O control routines, and a number of utility and scientific routines.

OPERATING SYSTEM/200: OS/200, introduced in September 1969, is a multiprogramming operating system for Model 1015 through 4200 systems with 49K to 524K characters of core storage. (At least 65K is required for FORTRAN compilation.) Also required are one disk file, three 1/2-inch magnetic tape units, card reader (or reader/punch), printer, console, and the Extended Multi-programming and Storage Protection features.

The most extensive version of OS/200 permits dual-job-stream processing in two hardware-protected background partitions, together with a foreground communications program and up to five simultaneous data transcription routines. Simpler versions of the system which omit selected functions can be generated. The Supervisor area holds the Resident Monitor and all data transcription routines; it ranges from 12K to 32K characters in size. Each background partition can range from 8K to 262K.

OS/200 facilities include an Easycoder Assembler, COBOL and FORTRAN compilers, the Easywriter data management language (which enables nonprogrammers to interrogate and produce reports from computer files), the Data Base Subsystem (a hierarchical file structure with associative relationship capabilities), and a variety of utility routines. OS/200 has been replaced by the newer and more comprehensive OS/2000 operating system, described below.

MSR/2000: MSR/2000 is designed to provide multi-programming capabilities for Series 2000 Model 2030 and 2030A systems with a maximum of 40,960 characters of main memory. Also required are a card reader or reader/punch, printer, one Type 259, 273, 274, or 278 Disk Pack Drive, and a console typewriter of Visual Information Control Console. The Storage Protection, Extended Multi-programming, 8-Bit Transfer, and Interval Timer features are also required. Communications equipment supported include remote batch, remote job entry, and transaction-oriented devices that operate in the binary synchronous mode.

MSR/2000 permits concurrent job-stream processing in a maximum of two main storage partitions. The upper partition can be used for communications processing and batch processing, and the lower partition can accommodate both program development and batch processing. In addition, a data transcription facility supports up to two simultaneous data transcription operations.

The MSR/2000 supervisor is a modular program that ranges in size from 8K characters for one job stream and the interface for one data transcription routine to 10K characters for the maximum of two job streams and support for two data transcription routines. Principal components of

the supervisor include the Resident Monitor, which performs program loading and initiation, input/output control, and allocation of central processor time. The Transitional Monitor is loaded into main storage upon program initiation and termination, reads and acts on system-level job control instructions, and performs dumps and other service functions. The Job Scheduler schedules jobs on a first-in, first-out basis, although a roll-out, roll-in facility permits priority jobs to be initiated. The Communications Controller permits a Series 200 or 2000 processor to be used as a satellite to a larger system for remote job entry and initiation or to perform as a central system for the 765/775/785 Series VIP terminals at remote locations.

Other features of MSR/2000 include: (1) Liberator/20, a conversion package that converts IBM System/360 Model 20 RPG programs and files into Honeywell RPG programs and file formats; (2) data management support for sequential, partitioned sequential, direct access, and indexed sequential files; (3) dynamic reporting of the system's status via either the VICC display unit or console typewriter; (4) file/device reassignment capability that allows efficient use of peripheral devices; and (5) a set of utilities that includes a disk/tape copy routine that provides for back-up for system, program, and data files.

MSR/2000 facilities include an Easycoder assembler, a full ANS COBOL compiler, the COBOL C compiler, a System/360 Model 20-compatible RPG compiler, a subset of the FORTRAN IV compiler, tape and mass storage sort programs, and library maintenance programs.

OS/2000: Introduced along with the Series 2000 computers in January 1972, OS/2000 is an improved version of the OS/200 multiprogramming operating system. OS/200 programs can be run directly under OS/2000, and most OS/200 users have moved to OS/2000 since it became available in January 1973. Programs written for use with the Mod 1 (TR) and Mod 1 (MSR) operating systems can also be run under OS/2000 with little or no reprogramming.

OS/2000 is designed for use with the medium-to-large-scale Series 2000 Models 1015 through 4200 and the Series 2000 Models 2030 through 2070. It requires at least 49K characters of core storage (or 65K for FORTRAN compilation) and can support up to 524K characters. Also required are a card reader or reader/punch, printer, console typewriter or Visual Information Control Console, and either two Type 277 or 279 Disk Pack Drives, three Type 273, 274, or 278 Disk Pack Drives, or three magnetic tape units and one Type 259, 273, 274, 277, 278, or 279 Disk Pack Drive. The Storage Protection, Extended Multiprogramming, 8-Bit Transfer, and Interval Timer features are also required.

OS/2000 permits concurrent job-stream processing in up to 10 dynamically assigned main storage partitions. Each partition can be used for either batch or communications processing. In addition, a data transcription facility handles up to five simultaneous media conversion operations (card to disk, tape to printer, etc.). An output writer is also available for system output.

The OS/2000 Supervisor is a modular program that is generated to meet each installation's requirements. Its central component is the Resident Monitor, which handles program loading and initiation, input/output control, and allocation of central processor time. The Transitional Monitor, loaded into main storage upon program initiation and termination, reads and acts upon all system-level job control instructions and performs dumps and other service functions. The Communications Controller supervises all communications activities and the associated data transfers; ►

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► it supports either the Type 286 Multi-Channel Communications Controller or the DATANET 2000 Communications Processor. The Job Scheduler schedules each job for processing in accordance with a user-assigned priority, which can be varied by the console operator. The Mod 1 Simulator permits direct execution of programs written for any of Honeywell's Mod 1 operating systems.

Other features of OS/2000 include: (1) a centralized recovery facility that provides program restart and file recovery for batch processing, transaction processing, and data transcription routines; (2) a roll-out/roll-in facility that permits jobs in progress to be rolled out to mass storage to allow immediate processing of urgent jobs; (3) a job accounting facility that logs the utilization of all system components; (4) a remote job entry (RJE) facility that enables users at remote terminals to initiate batch processing; (5) centralized input/output control at both the physical and logical levels; (6) a file/device reassignment capability that allows efficient use of peripheral devices; and (7) dynamic reporting of the systems' status via either the VICC display unit or console typewriter.

OS/2000 facilities include an EasyCoder assembler, a full ANS COBOL compiler, a FORTRAN compiler, the Easy-writer data management language (which enables non-programmers to interrogate and produce reports from computer files), tape and mass storage sort programs, mass storage data management programs, library maintenance programs, and a variety of other utility routines.

MOD 4 OPERATING SYSTEM: Mod 4 is a multi-programming operating system designed for use on medium-to-large-scale Series 200 or 2000 systems with 131,072 to 1,048,576 characters of core storage. Also required are four 1/2-inch magnetic tape units, at least one disk drive, card reader, printer, console, and the Extended Multiprogramming and Interval Timer features. Mod 4 is designed to be compatible with the older Mod 2 (Extended) Operating System with respect to user program requirements, data formats, job control language, and console messages. The Mod 4 system can be used on Series 200 Models 2015, 3200, and 4200 and on Series 2000 Models 2050, 2060, and 2070.

The Mod 4 system divides core memory into a system resident area and a user operating area. The system resident area contains a Resident Monitor, status tables, and the central I/O control system; its size varies with the features incorporated into the system. The user operating area is divided into a fixed number of "sets" of 8K characters or more. Each set, in turn, can be divided into two variable-sized partitions, each of 8K characters or more. The system can accommodate a maximum of 20 partitions, each capable of holding one program at a time.

Work flow is controlled by means of the queued-job method. A job can be placed in any one of 26 class queues and assigned any of 4 priorities within that queue. Each partition can be assigned to service from one to three class queues, and a given queue can be serviced by more than one partition.

Other noteworthy Mod 4 facilities include restarts, memory protection, job accounting, catalogued job control statements, and program dispatching on a linear and/or round-robin basis. The communications supervisor formats messages, handles error and sequence checking, polls remote terminals, oversees remote job entry, and performs a variety of other communications functions. Data management facilities permit accessing of sequential, indexed sequential, and direct access (random) files.



The DATANET 2000, introduced with the Series 2000 computers, is a minicomputer-based front-end processor that controls up to 120 lines and significantly improves the data communications capabilities of the medium-scale Honeywell computer systems.

Mod 4 language processors include an Assembler, COBOL and FORTRAN compilers, and a Report Generator. Other Mod 4 routines include a Tape Sort, Mass Storage Sort, Linkage Loader, library maintenance facilities, and numerous data transcription routines.

MOD 8 OPERATING SYSTEM: Mod 8 is designed specifically for the large-scale Model 8200 system. Minimum hardware requirements include 32K words (262K characters) of core storage, 18 million characters of disk storage, six magnetic tape units, card reader (or reader/punch), and printer. Memory-resident portions of the Mod 8 system occupy at least 10,240 words; these include the Monitor, resident Input/Output Package, and Terminal Dispatcher (which handles system I/O).

The Mod 8 Monitor controls overall system operations and manages the 8200's built-in program protection features. The Monitor handles job scheduling and resource allocation on a dynamic basis, using user-assigned priority ratings. The scheduling algorithm can be altered to meet the needs of each installation. Low-priority jobs can be interrupted to make way for jobs of higher priorities and then reloaded and restarted.

Mod 8 provides facilities for input/output control at both the physical and logical levels. At the logical level, Mod 8 can accommodate four file access methods: queued sequential (QSAM), basic direct (BDAM), queued indexed sequential (QISAM), and queued telecommunications (QTAM). The Mod 8 Communications Subsystem handles

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► message traffic between the 8200 and a variety of remote terminals. Recent Mod 8 enhancements, announced in December 1971, include a remote job entry (RJE) capability, dynamic memory reallocation, an object module collector, and improved restart capabilities.

MOD 8 offers four language processors: Assembler, COBOL, FORTRAN, and Report Program Generator. Other Mod 8 facilities include maintenance routines for source and object program libraries, tape and mass storage sort/collate routines, a group of scientific subroutines, a statistical package, a linear programming package, PERT Time, PERT Cost, and a group of data transcription routines.

COBOL: Honeywell offers COBOL compilers for use under all of the Series 200/2000 operating systems. In designing its COBOL compilers, especially for the smaller Series 200 models, Honeywell emphasized efficient compilation in small memory sizes (as low as 8K characters) rather than full implementation of the COBOL language. In general, the language facilities provided have adequately satisfied the programming requirements of most users, though problems may be encountered in attempting to compile and run COBOL programs written for other machines. The OS/2000 and Mod 4 COBOL compilers are complete implementations of 1968 ANS COBOL, with the exception of the Report Writer.

Honeywell has developed numerous COBOL compilers for the Series 200, including COBOL B, C, D, F, H, I, and L, plus Mod 1 (MSR) COBOL, OS/200 COBOL, OS/2000 COBOL, and Mod 8 COBOL. The letter designations refer to the memory requirements for compilation: 8K characters for COBOL B, 12K for COBOL C, etc. In general, the larger versions provide expanded language facilities.

The COBOL D, F, H, and I Compilers have been largely supplanted by Mod 1 (MSR) COBOL, introduced late in 1969, and MSR/2000 COBOL. The Mod 1 (MSR) ANS version supports all the language facilities of the four earlier compilers (except those that are no longer supported by CODASYL or ANSI), uses either disk or tape work files, and compiles in 32K. MSR/2000 COBOL is a subset of ANS COBOL and can be compiled in a disk-only configuration with 32K characters of main memory.

The OS/2000 COBOL Compiler, announced with the Series 2000 computers in January 1971, is a full implementation of the American National Standard COBOL language (X3.23-1968), including the Sort, Table Handling, and Rerun facilities but not the Report Writer. Also supported are the COBOL debugging and interprogram communications facilities as defined by CODASYL, as well as a subset of the COBOL communications facilities that enables users to access, process, and create messages or portions of messages. OS/2000 COBOL requires only 32K characters of main storage and either a disk-only or mixed tape-and-disk system for compilation.

FORTRAN: Honeywell offers a number of FORTRAN compilers for the Series 200 and Series 2000 computers. The FORTRAN D and FORTRAN F compilers support most of the facilities of the American National Standard FORTRAN language; FORTRAN D is usable on 16K systems with 4 magnetic tape drives, while FORTRAN F is usable on 24K disk systems.

The FORTRAN H, FORTRAN L, OS/200 FORTRAN, OS/2000 FORTRAN, and Mod 8 FORTRAN compilers all support the full ANS language plus a number of useful extensions, such as mixed-mode arithmetic, automatic con-

version of FORTRAN II I/O statements to FORTRAN IV, and some diagnostic and debugging features. In addition, the OS/2000 compiler can be used in load-and-go mode; and both the source and object programs, as well as the compiler, can reside on either tape or disk.

BASIC: The Series 200 BASIC System provides an on-line problem-solving capability for users at up to 39 remote terminals plus background batch processing. User programs are written in the BASIC language. The stand-alone system is usable on disk-oriented Model 1250 or larger systems with at least 65K characters of main storage.

REPORT GENERATORS: Though Honeywell places less emphasis on report generators than some competing manufacturers, it currently offers them for use under the Mod 1 (TR), Mod 1 (MSR), MSR/2000, Mod 4, and Mod 8 Operating Systems. The user supplies a source deck specifying the input and output formats and the required processing. The report generator produces a program in symbolic assembly language, which is then assembled to produce a relocatable object program which generates the desired report.

The Mod 1 (MSR) RPG Compiler was released in June 1971, along with the Model 105 computer system and a conversion aid, Liberator 20, that facilitates program conversions from IBM 360/20 RPG to the Honeywell RPG language. The compiler, designed to operate effectively on a 16K Series 200 system with one or more disk drives, provides dynamic table handling, automatic handling of control levels, program debugging facilities, and support of sequential, indexed sequential, and direct-access file organizations. The Liberator/20 program recognizes and automatically reconciles most of the hardware and RPG language differences between the IBM and Honeywell systems, thereby greatly simplifying the conversion of programs written in IBM 360/20 RPG and the associated data files. The "liberation" process requires a 16K Series 200 system with one or more disk drives.

Easywriter is an interpretive data management language, designed for use under the OS/2000 operating system that enables nonprogrammers to interrogate and produce reports from computer files. The files are described by means of a special Data Description Language. Specific requests are then written in a combination of English keywords and common arithmetic symbols and entered via either the system input unit or a remote terminal. Extended language facilities enable more advanced users to perform complex data management and retrieval functions.

ASSEMBLERS: The Easycoder assembly language is the standard symbolic programming language used to write machine-oriented programs for the character-oriented Series 200 processors. (A different assembly system called the Mod 8 Assembler is provided for the word-oriented Model 8200 Processor.) The Easycoder language is quite similar to the Autocoder language for the IBM 1400 Series computers.

Honeywell offers numerous Easycoder assemblers for use with the various Series 200 memory sizes and operating systems. The smallest version, Easycoder A, requires only a 4K processor, card reader, and punch. Systems with a 12K processor and three magnetic tape drives can use Easycoder C, which provides macro instruction facilities. More powerful assemblers are available for larger tape or disk systems.

UTILITY ROUTINES: Honeywell offers tape and/or disk sort routines, as appropriate, for use under each of the Series 200 operating systems. All tape sorts use the ►

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► read-backward polyphase merge technique, which uses from three to six tape drives and minimizes the number of tape passes required. The sorts are generalized programs which are controlled by user-supplied parameters.

Each software level also includes an appropriate complement of data transcription, file maintenance, diagnostic, and other utility routines.

The Easytab system consists of preprogrammed routines which facilitate transitions from tabulating equipment to the Series 200 by performing standard tab functions such as sorting, merging, selecting, totaling, reproducing, and reporting. Easytab requires an 8K system with two tape units.

TOTAL DATA BASE MANAGEMENT SYSTEM: The Total Data Base Management System provides facilities for operations of a data base that permit automatic cross-referencing among data records and access to the data base from conventional application programs written in COBOL or Easycode. Total also provides facilities for generating and maintaining a multi-file data base. It is available for Series 200 and 2000 systems with a minimum of 65K characters of main memory and the MSR/2000 or OS/2000 operating system. Total is a widely used proprietary package developed by Cincom Systems, and is described in detail in Report 70E-132-01. The package can be leased for use on Honeywell systems for \$750 per month of purchased (on a paid-up license basis) for \$26,500.

APPLICATION PROGRAMS: Honeywell places an unusually strong emphasis upon "packaged" application programs and offers Series 200 and Series 2000 users an exceptionally large selection. Some of the principal ones are listed below:

Banking:

- Central Information File
- Computerized Portfolio Analysis
- Demand Deposit Accounting
- Installment Loan Accounting
- Mortgage Loan Accounting
- Proof and Transit System
- Savings Accounting
- TRUMP (on-line banking transactions)

Distribution:

- Distribution by Value (inventory analysis)
- MI-DIS (management information system)
- PROFIT (inventory management)
- Vehicle Scheduling System

Education:

- Author Language System for CAI
- Pupil Personnel System
- Student Scheduling System

Financial Management:

- Accounts Payable
- Accounts Receivable
- General Ledger
- Inventory Reporting
- Payroll

Government:

- Databank Information Retrieval System
- Municipal Utility Billing
- Real Estate Tax Accounting
- Urban Information System

Hospital Computer Sharing System (HCSS):

- Accounts Payable
- Cost Allocation
- General Ledger Responsibility Reporting
- Inventory Reporting
- Patient Accounting
- Payroll
- Personnel

Insurance:

- FACILE (fire and casualty insurance)
- LILA (life insurance)

Manufacturing:

- FACTOR (manufacturing MIS)
- Disk Bill of Materials Processor
- Forecaster/Controller
- Net Requirements Generation
- Sales Order Processing
- Inventory Management Simulator
- ADAPT and SUBADAPT (numerical control)
- IMS/2000

Retailing:

- ASSIST (retailing MIS)
- Fashion Merchandise Management System
- Retail Accounts Payable
- Retail Accounts Receivable
- Retail Payroll
- Staple Stock Control System

PRICING

In January 1974, Honeywell announced selective price increases throughout its product line. Monthly rental charges for all equipment were raised approximately 2 percent. Purchase prices for Series 200 and Series 2000 equipment and maintenance charges remained the same, except that maintenance charges for the Model 4200 central processor were raised 5 percent. Hourly on-call maintenance rates were increased by 10 percent, and charges for systems engineering services also were increased by 10 percent. Honeywell also added a \$25 administrative enrollment fee for each student attending non-tuition education courses conducted at Honeywell education centers.

EQUIPMENT (SERIES 200): The following systems are representative of the types of Series 200 configurations that are widely installed and are supported by the standard Honeywell software. Obviously, they comprise only a small sampling of the many configuration possibilities within the Series 200 line. All necessary control units and adapters are included in the indicated prices.

The quoted rental prices are for short-term leases and include equipment maintenance. Honeywell also offers three-year and five-year leases at progressively lower monthly rates. A special seven-year lease plan is available only to state and local governments.

BASIC MODEL 105 DISK SYSTEM: Consists of 16K Type 106 Central Processor, 170-2 Disk Subsystem (9.2 million characters), 112 Printer (300 lpm), and 123 Card Reader (400 cpm). Monthly rental and purchase prices are approximately \$2,100 and \$77,000, respectively.

MODEL 115 DISK SYSTEM: Consists of 16K Type 116 Central Processor, two Type 172 Disk Pack Drives (18.4 million characters), 122-3 Printer (650 lpm), 123-4 Card

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► Reader (1050 cpm), 214-1 Card Punch (100-400 cpm), and 220-1 Console, Monthly rental and purchase prices are approximately \$4,100 and \$166,000, respectively.

MODEL 1015 TAPE/DISK SYSTEM: Consists of 65K Type 1016 Processor with Interval Timer, two Type 273 Disk Pack Drives (36.8 million characters) and 257 Disk Control, six 204D-1 Magnetic Tape Units (76.8KC) and 203D-1 Tape Control, 222-6 Printer (1100 lpm) with Print Buffer, 223-2 Card Reader (1050 cpm), 214-1 Card Punch (100-400 cpm), and 220-3 Console. Monthly rental and purchase prices are approximately \$13,300 and \$639,000, respectively.

MODEL 2015 TAPE/DISK SYSTEM: Consists of 262K Model 2016 Processor with Interval Timer, five-drive Type 278 Disk Pack Subsystem (175 million characters), eight 204D-3 Magnetic Tape Units (149.3KC) and 203D-3 Tape Control, 222-6 Printer (1100 lpm) with Print Buffer, 223-2 Card Reader (1050 cpm), 214-1 Card Punch (100-400 cpm), and 220-6 Console. Monthly rental and purchase prices are approximately \$22,000 and \$916,000, respectively.

MODEL 3200 TAPE/DISK SYSTEM: Consists of 262K Model 3201 Processor and same peripheral equipment as in the "Model 2015 Tape/Disk System" above. Monthly rental and purchase prices are approximately \$27,000 and \$1,106,000, respectively.

MODEL 8200 TAPE/DISK SYSTEM: Consists of 524K Type 8201 Processor with Scientific Instructions and Console, 8-drive Type 278 Disk Pack Subsystem (280 million characters), twelve 204D-5 Magnetic Tape Units (224KC) and two 203D-5 Tape Controls, 222-6 Printer (1100 lpm) with Print Buffer, 223-2 Card Reader (1050 cpm), and 214-1 Card Punch (100-400 cpm). Monthly rental and purchase prices \$57,000 and \$2,325,000, respectively.

EQUIPMENT (SERIES 2000): The following systems are representative of the types of Series 2000 systems that are supported by the standard Honeywell software and are likely to be widely installed. Obviously, they comprise only a small sampling of the many configuration possibilities within the Series 2000 line. All necessary control units and adapters are included in the indicated prices.

The quoted rental prices are for short-term leases and include equipment maintenance. Honeywell also offers three-year and five-year leases at progressively lower monthly rates. A special seven-year lease plan is available only to state and local governments.

MODEL 2020 DISK SYSTEM: Consists of 24K Type 2021-1 Processor, two Type 172 Disk Pack Drives (18.4 million characters), 214-2 Card Reader/Punch (400/100-400 cpm), and 112-2A Printer (450 lpm). Monthly rental and purchase prices are approximately \$2,800 and \$116,500, respectively.

MODEL 2030 TAPE/DISK SYSTEM: Consists of 40K Type 2032-1 Processor, 220-3 Console, Type 275-2 Disk Pack Subsystem (36.8 million characters), 204B-300 Magnetic Tape Subsystem (20KC), 214-2 Card Reader/Punch (100/100-400 cpm), and 222-3N Printer (650 lpm). Monthly rental and purchase prices are approximately \$4,610 and \$177,850, respectively.

MODEL 2040 TAPE/DISK SYSTEM: Consists of 65K Type 2041 Processor, two Type 275 Disk Pack Drives (36.8

million characters) and control, six 204D-1 Magnetic Tape Units (76.8KC) and 203D-1 Tape Control, 122-6 Printer (1100 lpm), 123-4 Card Reader (1100 cpm), 214-1 Card Punch (100-400 cpm), and 220-3 Console. Monthly rental and purchase prices are approximately \$11,100 and \$407,500, respectively.

MODEL 2070 TAPE/DISK SYSTEM: Consists of 262K Model 2071 Processor, five-drive Type 278 Disk Pack Subsystem (175 million characters), eight 204D-3 Magnetic Tape Units (149.3KC) and 203D-3 Tape Control, 222-6 Printer (1100 lpm) with Print Buffer, 223-2 Card Reader (1050 cpm), 214-1 Card Punch (100-400 cpm), and 220-6 Console. Monthly rental and purchase prices are \$27,930 and \$1,003,900, respectively.

SOFTWARE AND SUPPORT: Honeywell has not "unbundled" to date, so the equipment prices listed in this report include most of the software in the Honeywell Program Library, reasonable amounts of documentation, and systems support and training in accordance with specific commitments agreed to by Honeywell management.

The small-scale Model 105 system, however, is marketed with a support "package" that includes up to 30 mandays of technical support and up to 32 hours of computer time for program testing. A reasonable amount of training for the customer's programming and operating personnel is provided at a Honeywell location at no extra charge. Additional technical support can be purchased for \$60 per half-day at the customer's location or \$18 per half-day at a Honeywell support center. Additional computer time costs \$45 per hour. All standard Honeywell software is available to Model 105 users at no extra cost.

CONTRACT TERMS: Series 2000 equipment is available for purchase or for rental under a 1-year, 3-year, or 5-year lease. The basic monthly rental entitles the user to 9 hours of usage between the hours of 7 a.m. and 6 p.m. on Mondays through Fridays, with on-call remedial maintenance provided during that period. For scheduled usage beyond this period, with on-call maintenance service, the user pays an additional charge which is a fixed percentage of the basic monthly maintenance charge, as follows:

Monday through Friday,	9-16 hrs./day:	30%
Monday through Friday,	16-24 hrs./day:	50%
Saturdays,	0-9 hrs./day:	10%
Saturdays,	16-24 hrs./day:	20%
Sundays,	0-9 hrs./day:	10%
Sundays,	9-24 hrs./day:	20%

For Model 105 systems and all data communications terminals, the standard Honeywell rental contract includes equipment maintenance and allows unlimited usage of the equipment. For other Series 200 equipment, the standard rental agreement includes equipment maintenance and entitles the customer to up to 250 hours of equipment usage per month. Additional time is billed at the rate of 0.0006 times the base monthly rental for each hour of extra use. The central processor is metered to determine the rental due.

Users of leased Series 200 equipment with large communications systems can opt for a Series 2000 use and maintenance contract. Users of purchased Series 200 systems can also select either a Series 2000 or Model 105 type of maintenance arrangement, with a \$45 hourly rate for services outside the principal period of maintenance. ■

Honeywell Series 200 and 2000

EQUIPMENT PRICES

		<u>Purchase Price</u>	<u>Monthly Maint.</u>	<u>Rental (1-year lease)*</u>	<u>Rental (5-year lease)*</u>
SERIES 200 PROCESSORS AND MAIN STORAGE					
Model 105 Central Processors:					
†106-1	16,384 characters	27,170	83	570	510
106-2	24,576 characters	46,560	154	1,055	945
106-3	32,768 characters	60,060	216	1,485	1,330
Features for Model 105:					
1014	Eight-Bit Code Handling	1,250	3	28	28
1019-1	Simultaneous Use of Third Channel	3,025	11	70	61
Model 110 Central Processors:					
†111-1	4,096 characters	39,600	112	975	870
†111-2	8,192 characters	45,900	126	1,130	1,010
†111-3	12,288 characters	57,150	141	1,400	1,255
†111-4	16,384 characters	68,625	155	1,680	1,505
†111-5	20,480 characters	77,625	167	1,900	1,700
†111-6	24,576 characters	86,625	180	2,125	1,895
†111-7	28,672 characters	95,625	191	2,345	2,095
†111-8	32,768 characters	104,625	202	2,560	2,290
Features for Model 110:					
1111	Advanced Programming	3,240	8	81	81
1113	Editing Instructions	2,160	5	55	55
1119	Simultaneity for Second Read/Write Channel	9,900	18	240	214
Model 110-2 Central Processors:					
†114-2	8,192 characters	47,250	227	1,170	1,045
†114-3	12,288 characters	58,500	243	1,445	1,290
†114-4	16,384 characters	69,975	256	1,720	1,540
†114-5	20,480 characters	78,975	268	1,945	1,700
†114-6	24,576 characters	87,975	281	2,165	1,935
†114-7	28,672 characters	96,975	292	2,380	2,130
†114-8	32,768 characters	105,975	304	2,600	2,330
Model 110-3 Central Processors:					
†113-2	8,192 characters	60,300	227	1,485	1,325
†113-3	12,288 characters	71,550	243	1,760	1,570
†113-4	16,384 characters	83,025	256	2,040	1,825
†113-5	20,480 characters	92,025	268	2,260	2,020
†113-6	24,576 characters	101,025	281	2,480	2,215
†113-7	28,672 characters	110,025	292	2,700	2,415
†113-8	32,768 characters	119,025	304	2,920	2,610
Model 115 Central Processors:					
116-1	16,384 characters	50,020	168	1,145	1,025
116-2	24,576 characters	63,985	215	1,460	1,310
116-3	32,768 characters	77,905	262	1,780	1,595
Features for Model 115:					
1019	Simultaneous Use of Third Read/Write Channel	5,810	13	133	119
1014	Eight-Bit Code Handling	1,250	3	28	28
1044	Direct Transcription	2,250	6	63	56
Model 115/2 Central Processors:					
117-1	32,768 characters	98,880	302	2,170	1,945
117-2	49,152 characters	126,720	388	2,780	2,490
117-3	65,536 characters	154,560	475	3,395	3,035
Features for Model 115/2:					
015	Eight Additional Unit Loads of Power	6,480	15	171	156
016	Auxiliary Read/Write Channel	2,160	5	65	55
018	Expansion of Disk Control	2,160	5	65	55
1044	Direct Transcription	2,250	6	65	56
Model 120 Central Processors:					
†121-1	2,048 characters	37,155	102	940	850
†121-2	4,096 characters	42,555	112	1,070	975
†121-3	8,192 characters	53,355	126	1,360	1,220
†121-4	12,288 characters	64,155	141	1,625	1,470
†121-5	16,384 characters	74,955	155	1,900	1,714
†121-6	20,480 characters	83,595	167	2,335	2,110

* Rental prices include equipment maintenance.

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Honeywell Series 200 and 2000

EQUIPMENT PRICES

		<u>Purchase Price</u>	<u>Monthly Maint.</u>	<u>Rental (1-Year lease)*</u>	<u>Rental (5-year lease)*</u>
SERIES 200 PROCESSORS AND MAIN STORAGE (Continued)					
†121-7	24,576 characters	92,235	180	2,335	2,110
†121-8	28,672 characters	100,875	191	2,550	2,305
†121-9	32,768 characters	109,515	202	2,775	2,505
Features for Model 120:					
1011	Advanced Programming	3,240	8	81	81
1013	Editing Instructions	2,160	5	55	55
1014	Eight-Bit Code Handling	1,250	3	28	28
1015	Series 200 Control Unit Adapter	6,480	18	171	150
1016	Series 200 Control Unit Adapter and Read/Write Channel	12,960	35	337	299
Model 120-0 Central Processors:					
†121-0-1	2,048 characters	34,905	102	890	800
†121-0-2	4,096 characters	40,305	112	1,015	925
†121-0-3	8,192 characters	51,105	126	1,305	1,165
†121-0-4	12,288 characters	61,905	141	1,570	1,415
†121-0-5	16,384 characters	72,705	155	1,850	1,660
†121-0-6	20,480 characters	81,345	167	2,060	1,860
†121-0-7	24,576 characters	89,985	180	2,285	2,055
†121-0-8	28,672 characters	98,625	191	2,495	2,255
†121-0-9	32,768 characters	107,265	202	2,720	2,450
Features for Model 120-0:					
1011-0	Advanced Programming	3,240	8	81	81
1013-0	Editing Instructions	2,160	5	55	55
1015-0	Series 200 Control Unit Adapter	6,480	18	171	150
1016-0	Series 200 Control Unit Adapter and Read/Write Channel	12,960	35	337	299
Model 120-3 Central Processors:					
†121A-3	8,192 characters	66,865	245	1,710	1,545
†121A-4	12,288 characters	77,615	260	1,980	1,790
†121A-5	16,384 characters	88,365	274	2,260	2,035
†121A-6	20,480 characters	96,965	286	2,475	2,230
†121A-7	24,576 characters	105,565	298	2,695	2,430
†121A-8	28,672 characters	114,165	311	2,915	2,625
†121A-9	32,768 characters	122,765	321	3,130	2,825
Features for Model 120-3:					
1015-3	Series 200 Control Unit Adapter	6,480	18	171	150
1016-3	Series 200 Control Unit Adapter and Read/Write Channel	12,960	35	337	299
Model 125 Central Processors:					
†126-1	4,096 characters	53,535	141	1,360	1,230
†126-2	8,192 characters	64,335	155	1,645	1,475
†126-3	12,288 characters	75,135	170	1,910	1,725
†126-4	16,384 characters	85,935	185	2,190	1,970
†126-5	20,480 characters	96,735	197	2,460	2,220
†126-6	24,576 characters	105,415	210	2,685	2,420
†126-7	28,672 characters	114,055	220	2,895	2,615
†126-8	32,768 characters	122,695	232	3,120	2,815
†126-2-9	40,960 characters	138,600	250	3,630	3,250
†126-2-10	49,152 characters	157,500	268	4,125	3,690
†126-2-11	57,344 characters	170,520	286	4,465	3,995
†126-2-12	65,536 characters	183,330	304	4,800	4,290
Features for Model 125:					
1011	Advanced Programming	3,240	8	81	81
1013	Editing Instructions	2,160	5	55	55
1014	Eight-Bit Code Handling	1,250	3	28	28
1017	Simultaneity for Third Read/Write Channel	6,480	18	171	150
1018	Auxiliary Read/Write Channel (requires Feature 1017)	2,160	5	65	55
Model 125-3 Central Processors:					
†127-2	8,192 characters	81,485	274	2,080	1,880
†127-3	12,288 characters	92,235	289	2,355	2,125
†127-4	16,384 characters	102,985	304	2,625	2,370
†127-5	20,480 characters	113,950	316	2,910	2,625
†127-6	24,576 characters	122,550	328	3,125	2,825
†127-7	28,672 characters	131,150	340	3,345	3,020
†127-8	32,768 characters	139,750	352	3,560	3,220

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Honeywell Series 200 and 2000

EQUIPMENT PRICES

		<u>Purchase Price</u>	<u>Monthly Maint.</u>	<u>Rental (1-year lease)*</u>	<u>Rental (5-year lease)*</u>
SERIES 200 PROCESSORS AND MAIN STORAGE (Continued)					
Features for Model 125-3:					
1017	Simultaneity for Third Read/Write Channel	6,480	18	171	150
1018	Auxiliary Read/Write Channel (requires Feature 1017)	2,160	5	65	55
Model 200 Central Processors:					
†201-2-1	4,096 characters	57,240	127	1,505	1,345
†201-2-2	8,192 characters	68,040	142	1,795	1,605
†201-2-3	12,288 characters	78,840	157	2,070	1,855
†201-2-4	16,384 characters	89,640	171	2,355	2,105
†201-2-5	20,480 characters	100,440	186	2,635	2,355
†201-2-6	24,576 characters	111,240	201	2,915	2,605
†201-2-7	28,672 characters	122,040	216	3,205	2,860
†201-2-8	32,768 characters	132,840	231	3,485	3,115
†201-2-9	40,960 characters	145,800	249	3,820	3,415
†201-2-10	49,152 characters	158,760	267	4,160	3,715
†201-2-11	57,344 characters	171,720	285	4,505	4,025
†201-2-12	65,536 characters	184,680	303	4,835	4,325
Features for Model 200:					
010	Advanced Programming	4,320	11	124	113
013	Editing Instructions	3,890	9	113	102
015	Eight Additional Unit Loads of Power	6,480	15	171	156
016	Auxiliary Read/Write Channel	2,160	5	65	55
Model 1015 Central Processors:					
1016C-1	65,536 characters	196,080	330	4,300	3,845
1016C-2	98,304 characters	248,880	370	5,460	4,880
1016C-3	131,072 characters	292,080	405	6,410	5,730
Feature for Model 1015:					
1100A	Scientific Unit	24,750	48	620	570
Model 1200 Central Processors:					
†1201-1	16,384 characters	112,320	233	2,960	2,650
†1201-2	32,768 characters	146,880	282	3,995	3,570
†1201-3	49,152 characters	177,120	323	4,790	4,280
†1201-4	65,536 characters	205,200	362	5,660	5,050
†1201-5	81,920 characters	224,640	388	6,160	5,500
†1201-6	98,304 characters	241,920	413	6,620	5,910
†1201-7	114,688 characters	257,040	440	7,020	6,270
†1201-8	131,072 characters	272,160	459	7,420	6,620
Features for Model 1200:					
0191	Optional Instruction Package	2,160	5	65	60
1100A	Scientific Unit	24,750	48	620	570
1114	Storage Protection	2,160	5	65	60
1120	Extended Multiprogramming & 8-Bit Transfer (requires 1114)	10,530	45	264	232
Model 1250 Central Processors:					
†1251-1	32,768 characters	156,880	300	4,240	3,785
†1251-2	49,152 characters	187,120	342	5,040	4,495
†1251-3	65,536 characters	215,200	382	5,900	5,260
†1251-4	81,920 characters	234,640	407	6,410	5,720
†1251-5	98,304 characters	251,920	432	6,860	6,130
†1251-6	114,688 characters	267,040	458	7,260	6,480
†1251-7	131,072 characters	282,160	479	7,660	6,840
†1251-8	163,840 characters	319,400	527	8,520	7,610
†1251-9	196,608 characters	354,400	574	9,210	8,210
†1251-10	229,376 characters	390,000	627	9,810	8,750
†1251-11	262,144 characters	424,000	674	10,360	9,250
Features for Model 1250:					
†0191	Optional Instruction Package	2,160	5	65	60
1100A	Scientific Unit	24,750	48	620	570
†1114	Storage Protection	2,160	5	65	60
†1120	Extended Multiprogramming & 8-Bit Transfer (requires 1114)	10,530	45	264	232
Model 2015 Central Processors:					
2016-1	98,304 characters	319,200	490	7,000	6,260
2016-2	131,072 characters	340,800	525	7,480	6,680

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Honeywell Series 200 and 2000 EQUIPMENT PRICES

		<u>Purchase Price</u>	<u>Monthly Maint.</u>	<u>Rental (1-year lease)*</u>	<u>Rental (5-year lease)*</u>
SERIES 200 PROCESSORS AND MAIN STORAGE (Continued)					
2016-3	196,608 characters	424,800	585	9,320	8,330
2016-4	262,144 characters	475,200	640	10,420	9,320
Feature for Model 2015:					
1100A	Scientific Unit	24,750	48	620	570
Model 2200 Central Processors:					
†2201-1	16,384 characters	153,360	339	4,030	3,600
†2201-2	32,768 characters	196,560	399	5,160	4,605
†2201-3	49,152 characters	235,440	452	6,170	5,520
†2201-4	65,536 characters	272,160	503	7,140	6,370
†2201-5	81,920 characters	306,720	550	8,040	7,180
†2201-6	98,304 characters	336,960	592	8,830	7,890
†2201-7	114,688 characters	358,560	628	9,400	8,400
†2201-8	131,072 characters	380,160	658	9,960	8,900
†2201-9	163,840 characters	421,200	713	11,030	9,860
†2201-10	196,608 characters	453,600	759	11,890	10,620
†2201-11	229,376 characters	475,200	789	12,440	11,120
†2201-12	262,144 characters	496,800	818	13,010	11,630
Features for Model 2200:					
0191	Optional Instruction Package	2,160	5	65	60
1100A	Scientific Unit	24,750	48	620	570
1115	Second Input/Output Sector (4 additional channels)	4,320	10	121	110
1117	Storage Protection	2,160	5	65	60
1121	Extended Multiprogramming & 8-Bit Transfer (requires 1117)	5,630	24	140	119
Model 3200 Central Processors:					
†3201-1	131,072 characters	479,750	596	10,990	9,820
†3201-2	196,608 characters	591,255	680	13,490	12,060
†3201-3	262,144 characters	665,590	739	15,160	13,550
†3201-4	327,680 characters	777,095	825	17,660	15,780
†3201-5	393,216 characters	851,430	873	19,330	17,280
†3201-6	458,752 characters	962,935	966	21,830	19,510
†3201-7	524,288 characters	1,037,270	1,024	23,500	21,000
Feature for Model 3200:					
1100A	Scientific Unit	24,750	48	620	570
Model 4200 Central Processors:					
†4201-3	131,072 characters	567,005	679	14,140	13,100
†4201-4	196,608 characters	657,725	783	16,400	15,190
†4201-5	262,144 characters	748,445	886	18,660	17,290
†4201-5A	262,144 characters; 2-way interleaving	767,160	909	19,130	17,730
†4201-6	327,680 characters	839,165	990	20,830	19,380
†4201-7	393,216 characters	929,885	1,093	23,190	21,480
†4201-8	458,752 characters	1,020,605	1,196	25,450	23,570
†4201-9	524,288 characters; 4-way interleaving	1,111,325	1,300	27,710	25,670
Features for Model 4200:					
1101	Scientific Unit	22,685	49	575	530
1116	Third Input/Output Sector (8 additional channels)	22,685	49	575	530
1118	Extended Multiprogramming & 8-Bit Transfer	7,235	26	188	172
4214A	Two Buffered Input/Output Sectors (requires 1116)	17,625	25	432	400
4214B	Two Additional Buffered Input/Output Sectors (requires 1116 & 4214A)	15,275	21	379	347
4215	High-Speed Third Input/Output Sector (requires 1116)	6,580	24	167	152
4251	Printer for Field Service Testing	15,500	NA	274	244
Model 8200 Central Processors:					
8201-1	262,144 characters	1,161,220	2,300	28,280	26,200
8201-2	524,288 characters	1,552,900	3,065	37,820	35,030
8201-3	786,432 characters	1,958,400	3,865	47,690	44,180
8201-4	1,048,576 characters	2,350,080	4,645	57,300	53,100
8201-5	2,097,152 characters	3,288,449	6,050	77,100	71,400
Features for Model 8201:					
8201-B	Scientific Unit	34,560	73	845	780
8214	Expanded Input/Output Capability	69,120	145	1,690	1,565

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Honeywell Series 200 and 2000

EQUIPMENT PRICES

		<u>Purchase Price</u>	<u>Monthly Maint.</u>	<u>Rental (1-Year lease)*</u>	<u>Rental (5-Year lease)*</u>
SERIES 200 PROCESSORS AND MAIN STORAGE (Continued)					
8215	High-Speed Third Input/Output Sector	8,930	30	220	204
8272	Standby Console Typewriter	13,500	36	347	311
SERIES 2000 PROCESSORS AND MAIN STORAGE					
Model 2020 Central Processors:					
2021-1	24,576 characters	30,450	200	685	595
2021-2	28,672 characters	40,800	220	955	830
2021-3	32,768 characters	46,920	240	1,150	900
2021-4	40,960 characters	64,240	295	1,645	1,420
2021-5	49,152 characters	81,180	337	2,075	1,795
2021-6	57,344 characters	96,140	354	2,455	2,120
2021-7	65,536 characters	110,880	372	2,835	2,445
Features for Model 2020:					
001	Fourth Read/Write Channel (for Models 2021-4 thru 2021-7 only)	2,160	5	65	55
004	Cycle Speed-Up; 2.75 microseconds to 2.5 microseconds	10,000	30	281	245
Model 2030 Central Processors:					
2032-1	40,960 characters	100,800	325	2,695	2,330
2032-2	49,152 characters	110,250	360	2,950	2,545
2032-3	57,344 characters	120,750	395	3,230	2,790
2032-4	65,536 characters	130,200	435	3,480	3,005
2032-5	81,920 characters	141,000	455	3,960	3,420
3032-6	98,304 characters	158,000	475	4,435	3,835
Features for Model 2030:					
002	Type 275-OS/2000 Package	6,000	18	169	148
003	Type 277-OS/2000 Package	26,000	91	730	635
018	Expansion of Disk Control	2,160	5	65	55
1044	Direct Transcription	2,250	6	65	65
1100A	Scientific Unit	24,750	48	620	570
Model 2030A Central Processors:					
2032A-1	Basic Central Processor with 40,960 characters	114,800	363	2,940**	2,050**
2032A-2	Basic Central Processor with 49,152 characters	124,250	398	3,170**	2,250**
2032A-3	Basic Central Processor with 57,344 characters	134,750	433	3,425**	2,450**
2032A-4	Basic Central Processor with 65,536 characters	145,500	473	3,655**	2,650**
2032A-5	Basic Central Processor with 81,920 characters	159,000	493	4,090**	2,875**
2032A-6	Basic Central Processor with 98,304 characters	172,000	513	4,520**	3,100**
3032A-7	Basic Central Processor with 131,072 characters	196,000	548	4,900**	3,400**
2032A-8	Basic Central Processor with 196,608 characters	243,980	608	6,100**	4,300**
Features for Model 2030A:					
PM1A30	Second I/O Sector with 6 additional read/write channels	16,800	55	460**	430**
PM2A30	Cycle Speedup to 1.6 microseconds	10,000	38	300**	280**
PM3A30	OS/2000 Package (includes Type 213-3 Interval Timer with Feature 071, Interval Selector, Load Mode, and Expansion of Disk Control from 4 to 8 drives)	6,000	30	153**	148**
PM3B30	Buffered Adapter for Attachment of Type 277 Disk Pack Drives (PM3A30 required)	20,000	75	512**	484**
PM4A30	Scientific Unit	24,750	48	605**	452**
Model 2040 Central Processors:					
2041-1	49,152 characters	124,000	439	3,480	3,005
2041-2	65,536 characters	140,000	469	3,930	3,395
2041-3	98,304 characters	164,000	509	4,605	3,975
2041-4	131,072 characters	188,000	544	5,280	4,455
1100A	Scientific Unit	24,750	48	620	570
Model 2040A Central Processors:					
2041A-1	Basic Central Processor with 65,536 characters; 3.0 microseconds per 2-character fetch; includes 8 read/write channels and integrated control units for card reader, punch, and printer.	153,500	505	3,907**	3,150**
2041A-2	Basic Central Processor with 98,304 characters	177,500	545	4,522**	3,600**
2041A-3	Basic Central Processor with 131,072 characters	201,500	580	5,132**	3,900**
2041A-4	Basic Central Processor with 196,608 characters	249,480	640	6,350**	4,800**
2041A-5	Basic Central Processor with 262,144 characters	295,880	695	7,500**	5,900**
2041A-6	Basic Central Processor with 393,216 characters	355,070	868	9,350**	7,300**
2041A-7	Basic Central Processor with 524,288 characters	409,010	1,009	10,830**	8,400**

* Rental prices include equipment maintenance.

** Rental prices shown are for 3-year and 6-year leases, respectively.

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Honeywell Series 200 and 2000 EQUIPMENT PRICES

		<u>Purchase Price</u>	<u>Monthly Maint.</u>	<u>Rental (1-year lease)*</u>	<u>Rental (5-year lease)*</u>
SERIES 2000 PROCESSORS AND MAIN STORAGE (Continued)					
Features for Model 2040A:					
PM1A40	Buffered I/O sector, 4 additional read/write channels, and second set of integrated controls for card reader, punch, and printer	27,200	26	715**	490**
PM1B40	Second buffered I/O sector and 4 additional read/write channels (for total of 16); PM1A40 is prerequisite	24,000	36	873**	662**
PM2A40	1.5 microseconds per 2-character fetch	24,900	24	660**	449**
PM2B40	1.0 microsecond per 2-character fetch; PM2A40 is prerequisite	23,000	24	829**	635**
PM3A40	Scientific Sub-Processor	24,750	48	605**	452**
PM4A40	Accounting Timer	3,200	0	85**	64**
Model 2050 Central Processors:					
2051-C1	98,304 characters	203,280	507	5,710	4,925
2051-C2	131,072 characters	245,280	542	6,880	5,950
2051-C3	196,608 characters	291,280	602	8,190	7,060
2051-C4	262,144 characters	337,680	657	9,480	8,190
1100A	Scientific Unit	24,750	48	620	570
Model 2050A Central Processors:					
2051A-1	Basic Central Processor with 131,072 characters; 3.0 microseconds per 4-character fetch; includes 12 read/write channels and two integrated control units for card readers, punches, and printers	245,280	640		
2051A-2	Basic Central Processor with 196,608 characters	291,300	748		
2051A-3	Basic Central Processor with 262,144 characters	337,680	851		
2051A-4	Basic Central Processor with 393,216 characters	388,964	1,072		
2051A-5	Basic Central Processor with 524,288 characters	442,532	1,261		
2051A-6	Basic Central Processor with 1,048,576 characters	637,921	1,741		
Features for Model 2050A:					
PM1A50	Second buffered I/O sector and 4 additional read/write channels (for total of 16)	25,283	36		
PM1850	Two additional buffered I/O sectors (for total of 4); PM1A50 is prerequisite	59,545	72		
PM2A50	2.0 microseconds per 4-character fetch	22,967	35		
PM2850	1.0 microsecond per 4-character fetch; PM2A50 is prerequisite	56,923	35		
PM3A50	Scientific Sub-Processor	24,750	48		
Model 2060 Central Processors:					
2061-1	131,072 characters	295,280	613	8,290	7,160
2061-2	196,608 characters	349,880	697	9,820	8,480
2061-3	262,144 characters	404,480	756	11,350	9,800
2061-4	393,216 characters	477,280	890	15,390	11,570
2061-5	524,288 characters	535,280	1,041	15,020	12,970
1100A	Scientific Unit	24,750	48	620	570
Model 2070 Central Processors:					
2071-1	131,072 characters	493,800	1,065	13,860	11,970
2071-2	196,608 characters	546,400	1,115	15,330	13,240
2071-3	262,144 characters	598,400	1,165	16,790	14,500
2071-4	393,216 characters	662,400	1,320	18,590	16,050
2071-5	524,288 characters	720,000	1,440	20,200	17,450
2071-6	1,048,576 characters	1,060,000	1,920	29,740	25,680
MASS STORAGE					
†155	Disk Pack Drive; 3.6 million chars.	14,910	69	397	354
157B	Disk Control (for 258B Drives)	24,925	75	655	585
†157C	Disk Control (for 155 Drives)	11,700	32	287	255
170	Disk Pack Drive; 4.6 million chars. (for 170A-2)	10,905	76	271	244
170-2	Disk Storage Subsystem; 9.2 million chars.	20,460	151	510	456
171	Disk Pack Drive; 4.6 million chars.	12,875	75	342	304
172	Disk Pack Drive; 9.2 million chars.	21,200	81	488	434
173-2	Disk Storage Subsystem; 18.4 million chars.	29,165	188	725	655
173	Disk Pack Drive for 173-2; 9.2 million chars.	14,585	94	363	326
257	Disk Control (for 258, 259, & 273 Drives)	24,925	75	655	585
257-1	Disk Control (for 258, 259 & 273 Drives; 6- & 8-bit transfer modes)	26,800	94	720	640
257-3	Disk Control (for 278-5, -6, -7, -8 & -9 Drives)	15,000	104	1,595	1,430

* Rental prices include equipment maintenance.

** Rental prices shown are for 3-year and 6-year leases, respectively.

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Honeywell Series 200 and 2000

EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	Rental (1-Year lease)*	Rental (5-Year lease)*
MASS STORAGE (Continued)					
257B	Disk Control (for 259B & 259B Drives)	24,925	75	655	585
257B-1	Disk Control (for 258B & 259B Drives; 6- & 8-bit transfer modes)	26,800	94	720	640
†257C	Disk Control (for 155 Drives)	13,500	38	329	297
258	Disk Pack Drive; 4.6 million chars.	17,100	75	441	393
258B	Disk Pack Drive; 4.6 million chars.	17,100	75	441	393
259	Disk Pack Drive; 9.2 million chars.	24,000	94	620	555
259B	Disk Pack Drive; 9.2 million chars.	24,000	94	620	555
†260	Disk Control (for 258, 259, 273, 261 & 262)	26,100	113	725	645
260A	Disk Control (for 258, 259, 273, 261, & 262)	26,100	113	725	645
260-1	Drum Control (for 265 & 266)	19,800	119	NA	434
†261	Disk File; 150 million chars.	166,000	758	4,580	4,105
†262	Disk File; 300 million chars.	297,000	945	7,760	6,960
†266	High-Speed Drum; 4.2 million chars.	92,400	329	2,381	2,126
†270A-1	Random-Access Drum; 2.6 million chars.	50,070	206	1,235	1,110
†270A-2	Random-Access Drum; 5.2 million chars.	84,630	348	2,090	1,870
†270A-3	Random-Access Drum; 7.8 million chars.	119,400	490	2,945	2,630
273	Disk Pack Drive; 18.4 million chars.	34,650	98	910	815
274	Disk Pack Drives and Control; 147.2 million chars.	176,400	784	4,650	4,160
275-2	Disk Pack Subsystem; 2 drives and control; 36.8 million chars.	48,000	290	1,360	1,175
275	Disk Pack Drive; 18.4 million chars.	16,000	98	455	393
276-2	Disk Storage Subsystem; 74.8 million chars.	67,200	271	1,530	1,375
276	Disk Pack Drive for 276-2; 37.4 million chars.	23,040	98	530	473
277-2	Disk Storage Subsystem; 128 million chars.	86,020	250	1,995	1,800
277-3	Disk Storage Subsystem; 192 million chars.	108,680	332	2,530	2,270
277	Disk Pack Drive for 277-2; 64 million chars.	22,660	82	540	475
Type 278 Disk Pack Drives and Control:					
278-5	Five on-line spindles; 175 million chars	67,000	376	2,570	2,305
278-6	Six on-line spindles; 210 million chars.	85,000	419	2,980	2,670
278-7	Seven on-line spindles; 245 million chars.	87,000	516	3,560	3,190
278-8	Eight on-line spindles; 280 million chars.	105,000	559	3,970	3,560
278-9	Eight on-line spindles and one spare; 280 million chars.	107,000	621	4,555	4,080
278-15	Disk Storage Subsystem; includes control and five on-line spindles; 175 million chars.	80,000	480	2,350	1,865
278-17	Two-Spindle Expansion for 278-15; 70 million chars.	20,000	140	615	357
278-19	Expansion for 278-15 and 278-17; one on-line spindle and one spare; 35 million chars.	20,000	140	615	357
Type 279 Disk Pack Drives and Control:					
279-2	2 drives & control; 251.4 million chars.	162,800	563	3,925	3,515
279	Additional Disk Pack Drive for 279-2; 125.7 million chars.	28,600	99	690	620
Features for Mass Storage Equipment:					
070	Direct-Access Time Speedup (for 170-2 and 173-2)	1,760	5	43	43
072	Angular Position Indicator (for 260-1)	8,400	30	220	193
073	Angular Position Indicator (for 260-2)	12,600	45	333	295
074	Write Protect Switch (for 155, 172, 258, 258B, 259, 259B, 273, & 276-2)	900	4	21	21
075A	Track Protection (for 270A Drums)	1,370	8	38	33
076	Dynamic Disk Addressing (for 155, 157B, 157C, 172, 257, 257-1, 257-B-1, 257C, & 276-2)	1,050	2	27	27
077	Eight-Bit Transfer Mode (for 260)	2,475	13	65	55
078	Heat Exchanger (for 261 & 262)	5,500	18	139	124
079	Central Processor Finished Indicator (for 172, 258, 258B, 259, 259B, 273, & 276-2)	1,350	6	33	33
DASH/2000 Facility:					
096	Dual-Access Module for Type 277	44,550	90	1,115	960
097	Dual-Access Adapter for Type 277	1,800	6	45	39

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EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	Rental (1-year lease)*	Rental (5-year lease)*
MASS STORAGE (Continued)					
098	Dual-Access Module for Type 279	58,500	195	1,460	1,260
099	Dual-Access Adapter for Type 279	2,025	7	51	44
MAGNETIC TAPE					
103	Tape Control (for 204B-11B/12B; includes one 204B-11B unit)	19,440	75	505	451
103A	Tape Control (for 204B-13/14; includes one 204B-13 unit)	21,490	87	555	500
103B	Tape Control (for 204B-15/16; includes one 204B-15 unit)	24,300	89	595	545
103D	Tape Control (for 204B-17/18; includes one 204B-17 unit)	13,500	70	335	297
103E	Tape Control (for 204B-15/16; includes two 204B-15 units)	38,010	176	1,005	900
103F	Tape Control (for 204B-21/22; includes one 204B-21 unit)	31,080	118	810	725
103G	Tape Control (for 204B-23/24; includes one 204B-23 unit)	11,500	59	282	244
†203A-1	Tape Control (for 204A-1 units)	12,375	33	316	284
†203A-2	Tape Control (for 204A-2 units)	12,375	33	316	284
†203A-3	Tape Control (for 204A-3 units)	18,000	48	454	406
203B-1	Tape Control (for 204B-1/2 or 204B-3/4 units)	18,360	51	486	433
203B-2A	Tape Control (for 204B-5 units)	18,360	51	486	433
203B-4	Tape Control (for 204B-7/8 units)	18,360	51	486	433
203B-5	Tape Control (for 204B-11B/12B units)	12,960	35	347	311
203B-6	Tape Control (for 204B-9 units)	18,360	51	486	433
†203C-7	Tape Control (for 204C-13/14 units)	15,750	42	418	375
203D-1	Tape Control (for 204D-1 units)	29,400	84	775	690
203D-3	Tape Control (for 204D-3 units)	33,600	96	885	795
203D-5	Tape Control (for 204D-5 units)	37,800	108	995	890
203E-1	Tape Control (for 204F-1 units)	31,900	98	315	700
203E-3	Tape Control (for 204F-3 units)	34,100	98	870	750
203E-5	Tape Control (for 204F-5 units)	34,100	98	875	750
3/4-Inch Magnetic Tape Units:					
†204A-1	31.8KC	20,250	119	485	485
†204A-2	63.5KC	43,200	185	970	970
†204A-3	88.8KC	43,200	185	970	970
7-Track Magnetic Tape Units:					
204B-1	7.2/20KC; primary unit	15,120	89	404	363
204B-2	7.2/20KC; secondary unit	12,960	75	350	314
204B-3	16/44.4KC primary unit	21,600	126	575	515
204B-4	16/44.4KC; secondary unit	19,440	114	520	458
204B-5	24/66.7KC	30,240	176	810	725
204B-7	7.2 to 43.2KC	17,280	100	457	410
204B-8	16 to 64KC	25,920	151	690	615
204B-9	24 to 144KC	34,560	200	915	820
†204B-11B	5.2/14.4KC; primary unit	12,375	69	318	286
†204B-12B	5.2/14.4KC; secondary unit	10,125	58	254	228
204B-14	4.8 to 19.2KC; secondary unit	12,175	69	301	275
204B-16	9.6/26.7KC; secondary unit	14,400	80	345	319
204B-18	3.2/8.9KC; secondary unit	7,650	53	190	169
204B-22	12/33.4KC; secondary unit	12,800	86	345	314
†204B-24	8.9KC; secondary unit	7,650	53	190	169
204B-24A	3.2/8.9KC; secondary unit	7,650	53	190	169
7-Track Magnetic Tape Units (for Series 2000 only):					
204B-200	Magnetic Tape Subsystem; includes Tape Control and three 204B-201 tape units	28,600	150	730	635
204B-201	Magnetic Tape Unit; 10/3.6KC	8,800	44	225	194
204B-300	Magnetic Tape Subsystem; includes Tape Control and three 204B-301 tape units	35,200	176	900	780
204B-301	Magnetic Tape Unit; 20/7.2 KC	11,000	55	281	245
204B-400	Magnetic Tape Subsystem; includes Tape Control and three 204B-401 tape units	40,700	203	1,045	900
204B-401	Magnetic Tape Unit; 30/10.8 KC	12,100	61	312	271
9-Track Magnetic Tape Units:					
†204C-13	28.8KB; primary unit	20,250	114	520	458
†204C-14	28-8KB; secondary unit	20,250	114	520	458
†204D-1	38.4/76.8KB	15,960	91	426	378

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EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	Rental (1-Year lease)*	Rental (5-Year lease)*
MAGNETIC TAPE (Continued)					
204D-3	76.8/153.6KB	23,100	131	615	550
204D-5	112/224KB	33,600	191	890	800
204F-1	37.3/74.6KB	16,500	82	424	368
204F-3	74.6/149.3KB	18,700	93	480	414
204F-5	112/224KB	24,200	140	620	540
Features for Magnetic Tape Equipment:					
050	IBM Format Feature (provides end-of-file recognition; for 203B-1, -2, -4, & -6)	2,250	6	65	60
051	IBM Code Compatibility (BCD code translation; for 203B-1, -2, -4, & -6)	2,250	6	65	60
052	IBM 7-Channel Tape Feature (for 203D-1, -2, and -3 and 203F)	5,500	16	170	149
054	1200-bpi Recording Density (for 204B-9)	1,300	2	27	27
055	1200-bpi Recording Density (for 204B-7)	2,100	6	55	55
056	Dynamic Tape Addressing (for all Type 103, 203B, and 203D controls)	1,050	2	27	27
057	IBM Tape Compatibility (for 203B-5)	2,250	6	65	60
059	Density Switch (for 103, 103A, 103B, 103F, & 203B-5)	670	2	21	16
1051	EBCDIC/BCD Translator (for 203-E controls)	4,100	11	107	107
1052	EBCDIC Code Translator (for 203D-1, -2 and 203F)	4,100	11	107	107
1053	Write Capability (for 103G)	2,000	11	54	54
1054	Signed Zero EDCDIC Translator for 203E)	4,100	11	107	107
1055	IBM Tape Compatibility (for 103, 103A, & 103B)	2,160	6	65	55
1056	IBM Tape Compatibility (for 103D)	2,160	6	65	55
1057	ASCII Translator (for 203E)	4,100	11	107	107
1059	Density Switch (for 103D and 103G)	670	2	21	16
CARD INPUT/OUTPUT UNITS					
123	Card Reader; 400 cpm	9,000	62	228	201
123-2	Card Reader; 600 cpm	11,475	82	287	255
123-4	Card Reader; 1050 cpm	14,490	108	383	346
223	Card Reader and Control; 800 cpm	13,500	92	351	315
223-2	Card Reader and Control; 1050 cpm	15,120	113	400	357
214-1	Card Punch; 100-400 cpm	14,700	108	389	351
208-1	Card Punch Control (for 214-1)	6,750	18	171	156
214-2	Card Reader/Punch; 400/100-400 cpm	16,800	125	448	400
208-2	Card Reader/Punch Control (for 214-2)	10,125	28	263	231
Features for Card Input/Output Units:					
043	51-Column Adapter (for 223 & 223-2)	1,800	6	49	49
044	Direct Transcription (for 223 & 223-2)	1,125	5	33	28
045	90-Column Card Capability (for 223)	5,025	18	134	134
064	Direct Transcription (for 208-1 & 208-2)	1,125	4	33	28
1043	51-Column Adapter (for 123, 123-2, & 123-4)	1,125	8	33	28
PRINTERS					
112	Printer; 300 lpm	20,250	149	505	450
112-2A	Printer; 450 lpm	26,820	190	710	630
122-4	Printer; 950 lpm	46,200	286	1,225	1,095
122-6	Printer; 1100 lpm	51,660	299	1,370	1,235
222-2NA	Printer; 450 lpm	33,120	238	885	790
†222-3	Printer; 650 lpm	40,500	271	1,040	925
222-3N	Printer; 650 lpm	40,500	271	1,040	925
222-4	Printer and Control; 950 lpm	57,375	384	1,465	1,310
†222-5	Printer and Control; 450 lpm	30,870	223	825	740
222-6	Printer and Control; 1100 lpm	60,975	393	1,555	1,390
222-7	Printer and Control; 300 lpm	25,410	185	665	595
Printer Features:					
032	12 Additional Print Positions (for 222-3, -4, & -6)	4,500	30	109	109
034	Numeric Print (for 222-3)	5,625	15	144	129
035	Numeric Print (for 222-4)	1,125	4	53	28
036	Print Buffer (for 222-3, -4, -5, -6, & -7)	9,100	34	241	215
1032	12 Additional Print Positions (for 112 & 222-7)	2,250	15	65	60
1033	Eight-Channel Format Tape (for 222-7)	1,125	4	33	28

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Honeywell Series 200 and 2000 EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	Rental (1-year lease)*	Rental (5-year lease)*
PRINTERS (Continued)					
1034	12 Additional Print Positions (for 122, 122-3, 122-4, 122-6 & 222-5)	2,250	15	65	55
1036	Eight-Channel Format Tape (for 222-7)	1,125	4	33	28
MISCELLANEOUS INPUT/OUTPUT UNITS					
†209-2	Paper Tape Reader and Control; 600 cps	14,625	43	375	338
210	Paper Tape Punch and Control; 120 cps	10,125	34	263	231
212	On-Line Adapter (connects a Series 200 processor to a Honeywell 800 or 1800)	22,500	60	570	510
212-1	Central Processor Adapter (interconnects two Series 200 processors)	18,000	48	454	406
212-2	Central Processor Memory-to-Memory Transfer Unit	18,000	48	454	406
213-3	Interval Timer	3,600	11	102	91
071	Interval Selector Feature (for 213-3)	2,250	6	65	60
213-4	Time-of-Day Clock	9,000	26	231	204
220-1	Console	9,000	26	231	204
220-3	Console (replaces CP control panel)	13,500	38	347	311
220-6	Console (replaces CP control panel)	13,500	38	347	311
008	Pin-Feed Drive (for 220-1, -3, & -6)	1,125	6	28	28
220-8	Visual Information Control Console	37,600	105	1,010	870
1130	Status Display (for 220-8)	8,520	71	228	197
1131	Serial Printer (for 220-8)	10,600	40	284	259
1132	Remote Display (for 220-8)	5,750	33	155	133
1133	CRT Switch (for 220-8)	1,130	5	31	27
8220	Visual Information Control Console (for 8200)	24,300	105	650	565
232	MICR Reader-Sorter and Control; 600 dpm	56,250	324	1,390	1,345
232-5	MICR Reader-Sorter and Control; 600 dpm	40,180	301	1,045	935
234-0	MICR Reader-Sorter; 830 dpm	26,400	200	660	585
234-3	Control for 234-0 Reader-Sorter	14,950	32	373	317
234-4	Multiple Digit Selection	880	2	20	20
†233-2	MICR Control for Burroughs B 103	17,550	48	444	396
236	MICR Reader-Sorter; 1625 dpm	96,600	564	NA	2,040
236-1	MICR Control for 236	14,950	32	NA	317
236-2	Multi-Level E-13B Recognition (for 236)	19,300	72	NA	408
236-3	Endorser (for 236)	10,120	65	NA	214
236-4	Expansion Unit (for 236; allows up to 16 additional pockets)	5,060	13	NA	107
236-5	Expansion Module (for additional pockets)	15,180	47	NA	321
236-6	Mobile Carrier	175	NC	NA	NC
236-7	Short Document Read capability	690	2	NA	10
236-8	Short Document Module Expansion	460	2	NA	5
236-9	Batch Ticket Detector	690	2	NA	16
236-10	Resettable Stem Counter	460	2	NA	10
236-11	Basic Off-Line Sort	1,610	6	NA	27
236-12	Expanded Off-Line Field Sort	460	2	NA	5
236-21	Extended Sort Control	2,760	20	NA	54
236-22	Eight-Pocket Off-Line Sort Feature	1,965	8	NA	41
236-30	Document Reader-Sorter; four pockets, 1,625 dpm	51,060	423	NA	1,165
236-31	Document Reader-Sorter; eight pockets, 1,625 dpm	66,240	470	NA	1,455
236-32	Document Reader-Sorter; 12 pockets, 1,625 dpm	81,420	517	NA	1,750
MICRCOM System:					
235CP-1A	Basic MICRCOM System (Includes 16K chars. of memory, Control Panel, Power Supply, and basic peripherals)	99,440	614	2,470	2,195
235CP-1B	Basic MICRCOM System (Includes 24K chars. of memory, Control Panel, Power Supply, and basic peripherals)	118,330	685	2,955	2,630
243	Optical Document Reader and Control	67,200	464	1,805	1,565
042	Optical Mark Read Feature (for 243)	12,600	87	340	292
COMMUNICATIONS EQUIPMENT					
Single-Channel Communication Controls:					
281-1A	Western Union Teletype	6,750	28	172	157
281-1B	TWX CE; 8-level Teletypewriter	6,750	28	172	157
281-1C	5-Level Teletypewriter	6,750	28	172	157

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Honeywell Series 200 and 2000 EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	Rental (1-year lease)*	Rental (5-year lease)*
COMMUNICATIONS EQUIPMENT (Continued)					
281-1D	8-Level Teletypewriter	6,750	28	172	157
281-1E	TWX CE; IBM 1050	6,750	28	172	157
281-1H	Dataspeed 2; VIP 765, 775, & 785	6,750	28	172	157
281-1K	W.U. 180-Baud; IBM 1050	6,750	28	172	157
281-1KTP	Keypaper/Communicator (private lines)	6,750	28	172	157
281-1KTS	Keypaper/Communicator (switched network)	6,750	28	172	157
281-1M	Data Station (288-1)	6,750	28	172	157
281-1R	VIP Series Displays, Asynchronous	8,930	38	231	204
281-1TC	Burroughs TC-500	8,930	38	231	204
281-2B	Voice Lines up to 9600 bps; VIP 765, 775, & 785	8,100	33	210	198
281-2BSC	IBM BSC devices	10,125	43	264	232
281-2D	Voice Lines; IBM 7702, 1013	10,125	43	264	232
281-2F	Telpak A	10,125	43	264	232
281-2R	VIP Series Displays, Synchronous	10,765	45	280	247
281-137P	150-Baud; 8-Level Teletypewriter	6,750	28	172	157
281-137S	Voice Lines; 8-Level Teletypewriter	6,750	28	172	157
087	Long Check Feature (for certain models of the 281)	2,250	10	65	60
Multi-Channel Communication Controls					
286-1	MCCC; 2-3 lines	9,450	41	242	216
286-2	MCCC; 4-15 lines	14,440	60	366	328
286-3	MCCC; 16-63 lines	18,000	75	456	408
286-4	Message-Mode MCCC; 2-32 lines	34,000	149	915	820
286-5	Message-Mode MCCC; 33-63 lines	51,750	224	1,315	1,180
286-6	Message-Mode MCCC; 2-32 lines	44,400	139	1,175	1,060
286-7	Message-Mode MCCC; 33-63 lines	59,400	207	1,570	1,320
086	Parity Check Feature (for 286-1, -2, & -3)	2,250	10	65	60
087	Long Check Feature (for 286-1, -2 & -3)	2,250	10	65	60
285	Communication Adapters for MCCC (more than 30 different types are available within the indicated price ranges)	1,350 to 5,270	8 to 24	38 to 245	33 to 130
285-8	Audio Response Adapter (6 lines)	16,875	49	449	401
285-8A	Audio Response Expansion Module (2 lines)	3,825	11	102	91
285-8C	Audio Unit—31 Elements (6 lines)	24,750	71	665	590
285-8D	2-Line Expansion—31 Elements	1,350	5	38	33
285-8F	Audio Unit—63 Elements (6 lines)	32,625	91	875	780
285-8G	2-Line Expansion—63 Elements	1,800	5	49	44
285-8J	Audio Unit—189 Elements (6 lines)	51,750	146	1,380	1,230
285-8K	2-Line Expansion—189 Elements	2,050	5	55	49
Features for the Audio Response Adapter:					
082-1	Tone Answer-Back Option (2 lines)	675	2	21	16
082-2	Voice Answer-Back Option (2 lines)	675	2	21	16
083-1	Voice Cylinder; 31 phrases	2,050	NA	NA	NA
083-2	Voice Cylinder; 31 words and/or phrases	2,550	NA	NA	NA
083-3	Voice Cylinder; 63 phrases	3,200	NA	NA	NA
083-4	Voice Cylinder; 63 words and/or phrases	3,600	NA	NA	NA
083-5	Voice Cylinder; 189 words only	3,600	NA	NA	NA
DATANET 2000 Communications Processor:					
2600N	Data Communications Processor	32,050	165	875	785
2604	Memory Expansion Module; 4096 16-bit words (8K bytes)	4,000	27	128	115
2605N	Basic Multi-Line Controller (BMLC); handles up to 8 lines	4,200	15	106	95
2606	Asynchronous Interface Module (AIM) for BMLC; handles 2 lines	9,500	34	238	214
2607	Synchronous Interface Module (SIM)	9,500	34	238	214
2608	Expansion Base for BMLC; expands BMLC by 16 lines; maximum of seven 2608's per processor	840	3	22	18
2609	Asynchronous Line Module for 2608; provides 2 additional line interfaces	420	2	11	9
2610	Synchronous Line Module for 2608; provides 2 additional line interfaces	420	2	11	9
2611N	Expansion Drawer	2,520	9	64	57
2613	Cyclic Redundancy Check	840	3	22	18
2615N	Fixed-Head Disk and Control; 512K bytes	18,000	85	530	475
2617N	60-inch Expansion Cabinet	1,690	NC	55	48

* Rental prices include equipment maintenance.

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Honeywell Series 200 and 2000
EQUIPMENT PRICES

		<u>Purchase Price</u>	<u>Monthly Maint.</u>	<u>Rental (1-Year lease)*</u>	<u>Rental (5-Year lease)*</u>
COMMUNICATIONS EQUIPMENT (Continued—)					
Type 765 VIP Subsystems:					
765-1	Single-Terminal Subsystem	6,300	39	191	171
765-2	Dual-Terminal Subsystem	9,900	67	300	269
765-3	Cluster Subsystem; 3 terminals	16,740	116	510	454
765-4	Cluster Subsystem; 4 terminals	21,600	144	660	590
765-5	Cluster Subsystem; 5 terminals	26,100	184	795	710
765-6	Cluster Subsystem; 6 terminals**	30,240	212	920	825
765-20	Cluster Subsystem; 20 terminals**	103,680	668	3,150	1,815
765-21	Line Repeater Unit	420	2	11	9
765-23	23-inch Receive-Only CRT (as substitute for keyboard/display unit)	NC	NC	NC	NC
Type 775 VIP Subsystems:					
775-1	Single-Terminal Subsystem	7,200	47	219	195
775-2	Dual-Terminal Subsystem	12,240	72	372	333
775-3	Cluster Subsystem; 3 terminals	20,160	130	615	550
775-4	Cluster Subsystem; 4 terminals	25,380	155	775	690
775-5	Cluster Subsystem; 5 terminals	29,700	214	905	805
775-6	Cluster Subsystem; 6 terminals**	33,840	239	1,030	920
775-20	Cluster Subsystem; 20 terminals**	115,200	776	3,500	3,125
**Cluster subsystems with from 7 to 19 terminals and appropriate control units and interfaces are also available, at roughly proportional prices.					
775-21	Line Repeater Unit	420	2	11	9
775-23	23-inch Receive-Only CRT (as substitute for keyboard/display unit)	NC	NC	NC	NC
775-24	Shared Receive-Only Model 33 Printer	2,880	27	87	79
775-26	Receive-Only Printer; 30 cps, 118 positions	5,472	43	167	150
775-28	Function Key Group; 8 keys	630	2	17	15
775-29	Keypunch-Style Keyboard (as substitute for standard keyboard)	210	NC	5	5
775-30	Direct Timing Source for 775-1 & 775-2	1,050	3	28	24
Type 785 VIP Subsystems:					
785-1	Single VIP Station, including control unit	7,740	51	235	211
785-2	Shared Receive-Only Model 33 Printer	2,880	27	87	79
785-3	Receive-Only Printer; 30 cps, 118 positions	5,472	43	167	150
785-4	Function Key Group; 8 keys	630	2	17	15
785-5	Direct Timing Source (required for direct connection unless 785-7 is used)	1,050	3	27	24
785-6	Line Repeater Unit	420	2	11	9
785-7	Multi-Station Interface Unit (allows two 785-1's to share a line terminus)	3,150	13	82	74
785-8	Dual Channel Adapter (maximum of 4 per 785-7; allows 2 more 785-1's to share a line terminus)	336	1	8	7
Type 7700 VIP Subsystems:					
7700	Display Station (includes 960-char. display, control logic, keyboard)	4,860	27	152	131
7701	Single-Tape Cassette Unit	2,700	15	85	74
7702	Dual-Tape Cassette Unit	4,320	24	133	118
7705	Multistation Interface Unit	3,025	17	95	83
7710	Display Memory Expansion (for 1,012- or 1,920-char. display)	900	5	28	24
7711	Conversion Kit (for Single- to Dual-Tape Cassette Unit)	1,620	9	49	44
7712	Page Print Adapter (for 7713 or 7714 Receive-only Printer)	2,160	12	68	59
7713	Receive-Only Printer; 10 cps	2,160	12	68	59
7714	Receive-Only Printer; 30 cps	4,140	23	130	113
Type 7500 Multifunction Terminal System:					
7500	Programmable Controller (includes 4K-byte memory, keyboard, 960-char. display, and two tape cassette drives)	9,800	49	301	240
7502	4K-Byte Memory Expansion	1,600	8	51	39
7503	Multistation Adapter Unit (for one to six slave units)	1,800	9	57	44
7513	Slave Station CRT (includes keyboard and 1,920-char. display)	3,990	21	128	102
7515	Receive-only Printer; 30 cps	5,510	30	179	143
7520A	Moving-Head Disk; 2.5 million bytes	11,400	57	352	276
7525	Auxiliary Power and Controller Housing (required for more than two 7503, 7515, 7530, 7531, 7632, or 7533 units)	2,100	11	66	51
7530	Universal Asynchronous Communications Adapter (without modem)	1,400	7	43	34
7531	Asynchronous Communications Adapter (with Bell 103-compatible modem)	2,000	10	62	49
7532	Asynchronous Communications Adapter (with Bell 202-compatible modem)	2,400	12	72	59
7533	Synchronous Communications Adapter	1,800	10	57	44

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