Honeywell DPS 8 Series

MANAGEMENT SUMMARY

UPDATE: *Except for the addition of new peripherals, larger minimum memories, and operating system enhancements, the basic Honeywell DPS 8 line has remained a relatively stable product for the last few years. First introduced during the late 1970s, the medium- to large-scale processor line appears to have passed its prime from a technology viewpoint. Honeywell is expected to announce a new follow-on series that will eventually replace the DPS 8 line operating under GCOS 8 by the end of 1986 or the beginning of 1987. A separate mainframe product line operating under the Multics operating system will be phased out by 1988. The move is part of Honeywell plans to discontinue the Multics product at some point and introduce a new generation of Honeywell computers that will incorporate Multics elements, a Honeywell spokesperson explained.*

The DPS 8 Series continues to be home for much of the Honeywell mainframe user base. The series is actually composed of three separate model lines that each uses its own distinct operating systems. GCOS 8, and its earlier derivative, GCOS III, are the principal operating systems found in roughly 95 percent of all installations, according to the vendor. GCOS-based models include the entry-level DPS 8/47, the 8/49, 8/52, 8/62, and the top-end 8/70. The other operating systems are Multics, which now runs on only the DPS 8/70M processor, and CP-6, which runs on the DPS 8C Series. The DPS 8C Series consists of CP-6 versions of the five basic DPS 8 Series models.

New peripherals announced for only the larger DPS 8/52, 8/62, and 8/70 models are the MSP3880 mass storage processor and MSU3380 disk unit, and the MTS8200 Magnetic Tape Subsystem. The new MSP3880 mass storage processor, purchased from IBM Corporation on an OEM basis, supports up to 32 mass storage units using optional dual, switched, or dual simultaneous connections. Peak transfer rate is three megabytes per second. The ▷

Honeywell's DPS 8 Series includes 11 versions of five basic models. All models use the same basic architecture and are oriented toward a distributed processing environment.

The DPS 8 Series is Honeywell's family of medium- to large-scale, general-purpose, software-compatible processors. Accommodating a range of processing requirements, these systems are particularly adept in a distributed-processing environment and in handling communications-intensive applications.

MODELS: DPS 8/47, 8/47C, 8/49, 8/49C, 8/52, 8/52C, 8/62, 8/62C, 8/70, 8/70C, 8/70M.
CONFIGURATION: The DPS 8 systems can have from 8 to 64 megabytes of memory, 1 to 6 CPUs, and up to 54 channel slots per I/O processor.
COMPETITION: Amdahl 580; IBM 4300, 308X; NAS AS/8000, AS/9000; NCR V-8600; Sperry 1100 Series.
PRICE: Purchase prices range from $153,000 for a DPS 8/47 central system to $800,000 for a DPS 8/70C central system.

CHARACTERISTICS

MANUFACTURER: Honeywell Information Systems, 200 Smith Street, Waltham, MA 02154. Telephone (617) 895-6000. In Canada: 155 Gordon Baker Road, Willowdale, Ontario M2H 3N7. Telephone (416) 499-6111.

MODELS: DPS 8/47, 8/47C, 8/49, 8/49C, 8/52, 8/52C, 8/62, 8/62C, 8/70, 8/70C, 8/70M.

DATA FORMATS

BASIC UNIT: 9-bit bytes organized functionally to process 36-bit (word) groupings of information. Special features are also included for ease in manipulating 4-bit groups; 6-bit, 9-bit, and 18-bit groups; and 72-bit double-precision groups.

FIXED-POINT OPERANDS: Binary fixed-point numbers are represented with 18-bit half-word, 36-bit single-word, and 72-bit double-precision operands.

Decimal numbers used directly in hardware arithmetic commands are expressed as decimal digits in either the 4-bit or 9-bit character format. They are expressed as unsigned numbers or as signed numbers using a separate sign character.

Alphanumeric data is represented by 9-bit, 6-bit, or 4-bit characters. A machine word contains either four, six, or eight characters, respectively.

FLOATING-POINT OPERANDS: Binary floating-point numbers are represented with 36-bit single-word and 72-bit double-precision. In both operands, 0 represents the sign of the exponent, bits 1 to 7 the exponent, and bit 8 the sign of the fraction. The rest of the operand starting with bit 9 represents the rest of the fraction.

INSTRUCTIONS: All basic instructions use one 36-bit word. The processor performs operations using 6-, 9-, 18-, ▷

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▷ MSU3380 disk unit has a total formatted capacity of 1.8 gigabytes. The new MTS8200 Magnetic Tape Subsystem, purchased on an OEM basis from Storage Technology, consists of a single-channel controller and tape drive. Seven additional drives can be added to the controller/tape unit. The tape subsystem supports 800, 1600, and 6250 bpi tapes. A subsystem can be expanded to support two controllers and 16 tape drives. The tape and disk systems also meet Federal Information Processing Standards (FIPS) and can be attached to a new Honeywell Input/Output Processor (IOP), said to have three times the performance of the previous processor. The new IOP can support up to 16 input-output channels available with the new peripherals.

In addition to new peripherals, minimum main memories on the five GCOS models were increased from four megabytes to eight megabytes.

While hardware products have remained relatively stable, Honeywell has been announcing new releases for its operating system products. SR2500, the latest GCOS 8 release, is scheduled for shipment during second quarter 1986. MR 11.0, a new Multics release, was shipped in 1985, while MR 12.0, another Multics release, will be shipped by mid 1986. GCOS 8, Multics, and CP-6, the three Honeywell operating systems, are treated as separate products with their own distinct market appeal. For this reason they're marketed by three separate Honeywell divisions.

GCOS 8 Release 2500 is now the newest version of Honeywell's primary operating system. The latest GCOS release features a new transaction processing facility called TP-8. TP-8 is said to make more efficient use of central system resources, memory, message management, and fault tolerance.

(Control Program) CP-6, marketed by Honeywell Manufacturing Division, is a multiuse software system designed to enhance distributed processing. According to Honeywell, 75 users have installed CP-6. CP-6 replaced the CP-V operating system used on former Xerox processors and now allows former Xerox users to migrate to DPS 8/C systems. It is also now possible for CP-6 users to migrate to a CP-6 version of Honeywell's new top-end DPS 90 Series, although Honeywell has not made it possible for CP-6 users to migrate to the DPS 88 line, since there has been no user demand for it.

The future of Multics, the third Honeywell operating system product, remains much in doubt. Earlier this year Honeywell told the fewer than 60 Multics users worldwide that it plans to discontinue support of Multics at some point. For the time being, however, the vendor will continue to support the product through the life of the Multics product cycle although officials have not really specified when the product cycle would end. The sole Multics hardware product, the DPS 8/70M, will continue to be in new production until 1988. Two other Multics hardware offerings, the DPS 8/52M and 8/62M, are no longer in new production. Honeywell was forced to drop Multics after efforts to expand the customer base failed. Because the customer base remains tiny, the vendor believes further ▷

▶ 36-, and 72-bit operands. All single-word instructions use bits 0 through 17 for the address field, bits 18 through 27 for the op code, bit 28 as the interrupt inhibit bit, bit 29 as the address register bit, and bits 30 through 35 as the instruction address modifier. Multiword instructions use bits 0 through 17 for various functions as required, bits 18 through 27 as the op code, bit 28 as the interrupt inhibit bit, and bits 29 through 36 as the operand descriptor 1 modification field. Words 2, 3, and 4 contain the operand descriptor of indirect pointer for operands, 1, 2, and 3, respectively.

INTERNAL CODE: 9-bit ASCII code is standard.

MAIN MEMORY

The DPS 8 Series uses solidstate main memories and cache memories. Main memories feature automatic error detection and correction.

STORAGE TYPE: Metallic oxide semiconductor (MOS).

CAPACITY: See Table 1.

CYCLE TIME: Honeywell does not disclose cycle times.

CHECKING: A 5-bit error-correcting Hamming code is appended to each 36-bit word. Single-bit errors are corrected automatically, and multiple-bit errors are detected and flagged for subsequent error-recovery routines. Odd parity is utilized throughout the processor.

RESERVE STORAGE: The DPS 8 systems use a four-level ring protection scheme that is implemented in system firmware with supporting hardware registers. Each user program segment has an associated segment descriptor that is stored in tables in main memory. Within each segment descriptor are two 2-bit fields that specify the security level required by a user program to execute or write to a particular segment. Hardware also checks that data addresses generated during program execution do not exceed specified boundaries. The segment descriptors also contain two bits that can deny execution or write access to a user program.

CENTRAL PROCESSORS

The DPS 8 central processors employ a memory-oriented structure with from one to four system control units (SCUs) managing the communications between system components and servicing all demands on main memory by other system components. An I/O multiplexer (IOM) (at the DPS 8/47 and 8/49 level), and a FIPS-compliant Input/Output Processor (at the DPS 8/52, 8/62, and 8/70 level) interfaces the peripheral processors and front-end communications processors with the system control units. The units also control data transfers between I/O devices and main memory concurrently with program execution.

Each processor module in the system has full program execution capability and conducts all actual computational processing (data movement, arithmetic, logic, comparison, and control operations) within the information system. The processor, which communicates only with the system control unit(s) and associated memory, consists of an operations unit, a control unit, a decimal unit, and a virtual unit. The operating unit executes arithmetic and logical operations; the control unit performs instruction fetching, address preparation, memory protection, and data fetching/storing; the decimal unit operates in association with the control unit to execute decimal instructions; and the virtual unit prepares addresses for use in the virtual memory mode. These units operate with relative independence and maximum overlap to provide a high rate of instruction execution.

Virtual memory under GCOS 8 and CP-6 provides an extremely large, directly addressable memory space and a ▶

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TABLE 1. SYSTEM COMPARISON

MODEL	DPS 8/47	DPS 8/49	DPS 8/52	DPS 8/62	DPS 8/70
SYSTEM CHARACTERISTICS					
Date announced	First Quarter 1983	First Quarter 1983	October 1979	October 1980	October 1979
Date first delivered	First Quarter 1983	First Quarter 1983	Second Quarter 1980	Third Quarter 1981	Second Quarter 1980
Field upgradable to	8/49	See footnote*	8/62	8/70	DPS 88 or DPS 90 Series
Relative performance	0.65	0.95	0.95	1.3	1.7
Number of processors	1-2	1-4	1-2	1-2	1-6
Cycle time, nanoseconds	Not specified	Not specified	Not specified	Not specified	Not specified
Word size, bits	36	36	36	36	36
Operating systems	GCOS, GCOS 8, CP-6	GCOS, GCOS 8, CP-6	GCOS, GCOS 8, CP-6	GCOS, GCOS 8, CP-6	GCOS, GCOS 8, CP-6, Multics
MAIN MEMORY					
Type	64K-bit MOS	64K-bit MOS	64K-bit MOS	64K-bit MOS	64K-bit MOS
Minimum capacity, bytes	8-12MB	8-16MB	8-16MB	8-16MB	8-16MB
Maximum capacity, bytes	32MB	32MB	32-64MB	32-64MB	32-64MB
Increment size	2MB	2MB	2MB	2MB	2MB
Cycle time, nanoseconds	750	750	750	750	750
BUFFER STORAGE					
Minimum capacity	32K bytes	32K bytes	32K bytes	32K bytes	32K bytes
Maximum capacity	32K bytes	32K bytes	32K bytes	32K bytes	32K bytes
Increment size	—	—	—	—	—
INPUT/OUTPUT CONTROL					
Number of channels:					
Byte multiplexer	—	—	—	—	—
Block multiplexer	—	—	—	—	—
Word	—	—	—	—	—
Other	20	20	36-54	36-54	36-54

Upgrading from a DPS 8/49 to a larger processor involves a processor swap out.

▷ research and development efforts could not be financially justified. Future Honeywell plans now call for developing a new generation of 32-bit computers that would not use Multics, but would incorporate Multics elements. Honeywell officials are hoping current Multics users will eventually migrate to these new systems.

As part of the latest Multics releases, enhancements were made to transaction processing capabilities, data base software, and the C compiler. Other enhancements involve support for larger capacity 3380 disk drives, purchased on an OEM basis from IBM, and PC support. Another major improvement centers around operating system security features. Because of this work, it's the only operating system to have earned a U.S. Department of Defense B2 security rating. The National Computer Security Center, (NCSC), awarded the B2 security rating to Multics Release 11.0 in August 1985, the highest rated large-scale operating system to date. B2 is one of seven rating levels the NCSC can award. A B2 is two rating levels down from an A1 rating, the highest rating that can be awarded.

Multics, derived from MULTiplexed Information and Computing Service, was first developed during the 1960s by General Electric Co. (GE), Bell Laboratories, and MIT. Multics pioneered many modern operating system features and is considered a forerunner to Unix. Honeywell, which purchased GE's computer division in 1970, first began marketing Multics commercially in 1973. Multics is now marketed by Honeywell Office Management Systems Division.

The DPS 8/70M and its Multics operating system software is designed to provide an information management system to assist users in the decision-making process. Included are end-user capabilities for ad hoc query of complex shared ▷

▶ complement of registers and instructions to enable management of virtual address space. The hardware environment for virtual memory is composed of four elements: working spaces, domains, segments, and pages. The working spaces and pages are physical elements, and the segments and domains are logical elements. They are treated as separate components of the virtual memory but must be interpreted in the context of the entire environment, as they are closely related in their interaction with each other.

The virtual memory is divided into approximately equal parts called working spaces. A working space has an associated page table that identifies the real memory location. There are 512 working spaces in memory, each of which contains 1024 words (4096 bytes). They are used for memory management. Segments are logical elements that reside within a working space, and vary in length from one byte to one or more pages. Segments and pages can be compared to a tape file and a tape reel in that a page (tape reel) may contain several segments (files) or a segment (file) may comprise several pages (tape reels). A domain includes more than one noncontiguous segment in one or more working spaces.

All DPS 8 processors use a high-speed cache memory. If an instruction or data to be referenced by the central processor is available in the cache memory, the information can be retrieved from the cache rather than from main memory, which reduces access time and contention. This process increases the effective system throughput.

The DPS 8 hardware architecture is memory-centered with the processors and I/O multiplexer (IOM) or Input/Output Processor (IOP) using a common memory subsystem and interface through a system control unit (SCU). This architecture is designed to support simultaneous and asynchronous execution for maximum throughput. To support the distributed systems environment (DSE), one or more front-end network processors (FNPs) are used in the DPS 8 family. The FNP controls all remote terminal interaction with DPS 8 systems. It is connected to the central system via an IOM or IOP, and provides the various interfaces required by the elements and protocols of a distributed system ▶

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relational data bases, "what if" analyses, report writing, personal filing, text processing, electronic mail, and electronic conferencing. Of course, extensive security features make Multics a highly regarded system among users at installations where access security is a major consideration.

While Multics now operates on only one DPS 8 Series processor, CP-6 and GCOS systems each support five mainframe products. Basic DPS 8 models are designed to serve communications-intensive applications. Operating within Honeywell's Distributive Systems Environment (DPS), DPS 8 models can be used as the host, cohost, and, with the smaller models, the satellite computer in a communications network. As processing needs grow, DPS 8 Series users operating under GCOS 8 can migrate to the DPS 88 Series or the DPS 90 Series, now Honeywell's largest and most powerful family of processors.

Honeywell divides DPS 8 Series models into two groups. One group consists of the DPS 8/47 and 8/49 models, compact mainframes designed for use as satellite processors at major remote sites where processing workload and growth are substantial. The second group consists of the DPS 8/52, 8/62, and the 8/70, progressively larger models that can serve as host processors at sites where processing workload is heavy.

Users can upgrade to a larger system without the need to make major changes to existing hardware and software configurations. Upgrading can be accomplished without a processor swap out for all systems except the DPS 8/49. Because of differences in architecture between the smaller and larger processors, when an 8/49 user wants to migrate to one of the larger systems within the DPS 8 Series, a processor swap out is required.

Users can also augment their current systems by adding memory and more processors. Multiprocessor versions are available for all models within the DPS 8 Series. To assure maximum system availability and to minimize downtime, all models are offered in full tandem versions.

All DPS 8/47 and 8/49 models use microprocessors with 16K/64K chips to perform program execution, computation, and other system control functions independently. The newer systems use LSI circuitry to support the microprocessors in such areas as cache memory, directory, and control store functions. The larger systems, the DPS 8/52, 8/62, and 8/70, use MSI Schottky TTL logic extensively in system design. All DPS 8 systems use a high-density universal (HDU) board, which reduces the maximum number of boards required.

Each basic DPS 8 system is equipped with a central processor, one System Control Unit (SCU), one Input/Output Multiplexer (IOM) or Input/Output Processor, and eight megabytes of memory. The new Input/Output Processor, introduced last year, works with the larger 8/52, 8/62, and 8/70 processors. The new FIPS-compliant IOM was introduced to accommodate the new larger capacity disk and tape devices that are attachable to these systems. DPS 8 system components interact dynamically and execute asyn-

as well as a facility for communication with the host system. By performing message management and message handling, the FNP frees the host for other processing functions. The resources of the central system are called upon only when a message is submitted for processing.

Each DPS 8 processor includes a large number of processor-accessible registers, as shown in the following table:

	Length (bits)	Quantity
Accumulator	36	1
Quotient	36	1
Accumulator-Quotient	72	1
Exponent	8	1
Index	18	8
Indicator	18	1
Time	24	1
Instruction Counter	18	1
Address	24	8
Mode	33	1
Cache Mode	28	1
Fault	72	1
Control Unit History	72	16
Operations Unit History	72	16
Decimal Unit History	72	16
Virtual Unit History	72	16
Working Space	9	8
Safe Store	72	1
Linkage Segment	72	1
Argument Stack	72	1
Parameter Stack	72	1
Instruction Segment	72	1
Operand Descriptor	72	8
Segment Identity	12	8
Instruction Segment Identity	12	1
Pointer	—	8
Data Stack Descriptor	72	1
Data Stack Address	17	1
Page Directory Base	15	1
Option	3	1
Pointer and Length	36	8

The DPS 8 uses virtual memory which provides the processor with a directly addressable virtual space of 2^{43} bytes. It also includes the capability of translating the virtual address to a real memory address. Two different addressing modes are provided: absolute and paging. In the absolute addressing mode a virtual address is generated, but is not mapped to a real address. The paging mode maps the virtual memory address to a real memory address.

After a virtual address has been mapped to a real address, the information is stored in the cache (or associative) memory. The amount of this memory varies with the processors. The DPS 8/47, 8/49, 8/52, 8/62, and 8/70 each have 32K bytes of cache area. The corresponding DPS 8/C and 8/M models contain the same amount of cache memory. When a new address not contained in the cache has been mapped and the cache memory is full, the new entry replaces the oldest using a first-in/first-out algorithm.

The DPS 8 processor models have a comprehensive instruction set for performing data movement, binary arithmetic, shifting, logic, and control operations. The instruction set includes arithmetic facilities for performing variable-length fixed- and floating-point decimal arithmetic, and bit and byte string manipulation for processing bytes, BCD characters, packed decimal data, and bit strings.

The basic instruction set has a total of 289 instructions, which include 88 fixed-point binary arithmetic, 20 address register, 29 Boolean, 2 descriptor register, 10 master mode,

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▷ chronously and simultaneously using a common memory subsystem to help increase system performance.

Each basic DPS 8/C, which runs under CP-6, includes a processor, one SCU, one IOM, and one Front-End Network Processor (FNP). The System Control Unit is the principal interface between central system components. It provides complete system interrupt control which regulates communication between components and handles memory demands on a priority basis. Memory units and Input/Output Multiplexers are directly connected to the SCU. All central processors are equipped initially with one or two SCUs. The DPS 8/70 can be expanded to four SCUs.

Memory systems are based on 64K-bit MOS technology, and each processor running under GCOS 8 has a minimum of eight megabytes of memory. The CP-6 systems contain 12 megabytes in the DPS 8/47C and 16 megabytes in the DPS 8/49C, 8/52C, 8/62C, and 8/70C. The DPS 8/47, 8/47C, 8/49, 8/49C, 8/52, 8/62, can go up to 32 megabytes, and all DPS 8/70 models to 64 megabytes. The DPS 8/52C and 8/62C can also be increased to 64 megabytes.

Communications with remote terminals, as well as remote hosts, is an important element in Honeywell's Distributed Systems Environment. Two Front-End Network Processors (FNPs) are available for communications on DPS 8 models: the Datanet 6661 and Datanet 8. A version of the Datanet 8, the 8/C, is used with DPS 8/C systems.

COMPETITIVE POSITION

While the DPS 8 line has remained a relatively stable Honeywell offering during the past few years, competing product lines have undergone extensive realignments during the last year. Burroughs, IBM, and IBM plug-compatible vendors, NAS and Amdahl, have all brought out major model enhancements or new replacement models within this market segment. Most of these new processors feature emitter coupled logic and the denser 256K-bit memory chips. By comparison, the DPS 8 line features transistor-to-transistor logic and 64K-bit MOS memories.

To make the DPS 8 a bit more competitive as it reaches product maturity, Honeywell increased basic main memories for the five GCOS models from four to eight megabytes without increasing the purchase price. Many new DPS 8 customers continue to be drawn from Honeywell users migrating from older Honeywell models such as the Level 66 Series; however, these processor migrations are decreasing. Honeywell is expected to announce a replacement for the DPS 8 line by the end of this year or early next year.

Data communications and distributive data processing applications are two major market segments Honeywell has fashioned for its DPS 8 family of processors. Multiprocessing capabilities and the availability of tandem systems help to enhance processing efficiency in highly interactive environments. In a DPS 8/70 system, as many as six processors can be configured. Maximum processor main memories can range from 32 to 64 megabytes, depending on model. ▷

▶ 17 micro, 29 multiword, 4 pointer register, 18 privileged, 20 transfer of control, and 18 miscellaneous operations.

The central processor operates in three modes: master mode, privileged master mode, and slave mode. Master and privileged master modes are reserved for GCOS 8. They allow unrestricted access to all memory, permit initiation of data transfer operations through the IOMs, and permit the setting of control registers. Slave mode is used by GCOS 8 when appropriate, and for the execution of all user programs. Programs executing in slave mode cannot perform certain control operations. This trimodal operation provides effective operating control and security in a multiprogramming environment.

In DPS 8 systems, every external interrupt or internal fault results in the setting of a specific interrupt cell in the system controller. The interrupt cells are organized in a numbered priority chain. Any active system module connected to a system controller port may request the setting of an interrupt cell. Each system controller contains 32 interrupt cells.

One system control center is required for the DPS 8. The CSU6601 is a desktop arrangement with a 120-cps printer and a 12-inch, 1920-character CRT and keyboard. A 23-inch remote display is optional. Also available are the larger CSU6004, with a 30-cps printer and an optional 23-inch remote display unit, and the CSU6005, which has two 12-inch screens with an option for up to two 23-inch remote displays. The keyboard, common to all consoles, is a solid-state unit with an alphanumeric keyboard consisting of 26 alphabetic, 10 numeric, and 28 special character keys. A 120-cps option is available for the CSU6004 and CSU6005 printers.

Additional CSU6601 options include the CSU6602 Auxiliary Console with 120-cps printer and keyboard, CSF6602 Auxiliary Keyboard Display Attachment Feature, CSF6603 Additional Keyboard Display, CSF6604 Large Screen Monitor (the 23-inch monitor), and CSF6606 Extended System Control Center.

SPECIAL FEATURES: In addition to the widely used GCOS operating systems, Honeywell makes separate DPS 8 mainframe versions to accommodate CP-6 or Multics operating systems. The five CP-6 models are part of the DPS 8C Series and the single Multics processor is called the DPS 8/70M.

PHYSICAL SPECIFICATIONS: DPS 8 systems must be located in a room with raised floor or equivalent. The room ceiling must be 8.5 feet above the raised floor, with at least 8 to 12 inches between subfloor and raised floor. Power requirements must meet these specifications: a voltage of 208, 240, 440, or 480 VAC ±10 percent for the motor generator set; 60 Hertz nominal with 60.5 maximum and 59.4 minimum frequency; three-phase wire with a maximum phase variation of 5 percent from the nominal; and 120/208 VAC, five-wire cable with ground for peripheral equipment (voltage variation is ±10 percent).

A design temperature between 68 and 78 degrees Fahrenheit with a relative humidity between 40 and 60 percent noncondensing is permissible, although a temperature of 73 degrees with a relative humidity of 50 percent is recommended. Once a temperature and relative humidity are selected, the temperature should not fluctuate more than ±2 degrees Fahrenheit or the relative humidity more than ±5 percent.

CONFIGURATION RULES

The DPS 8/47 and 8/49 central systems are packaged within a single cabinet. The DPS 8/47 (CPS8130) and DPS 8/49 (CPS8132) are equipped with eight megabytes of main memory, one CPU, one system control unit (SCU), and one ▶

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TABLE 2. MASS STORAGE

MODEL	MSU0451	MSU0500	MSU0501	MSU3380	MSU3382
Cabinets per subsystem	16	8-15	8-15	8	8
Disk packs/HDAs per cabinet	1	2	2	2	2
Capacity	157MB	626MB	1.1GB	802MB/1.8GB	802MB/1.8GB
Tracks/segments per drive unit	815	1,630 per surface	1,686 per surface	13,275	13,275
Average seek time, msec.	30	25	25	15	15
Average access time, msec.	38.3	33.3	33.3	23.3	23.3
Average rotational delay, msec.	8.3	8.3	8.3	8.3	8.3
Data transfer rate	716K bps	1065K bps	1065K bps	3M bps	3M bps
Controller model	MSP0611/0612	MSP0611/0612	MSP0611/0612	MSP3880/3884	MSP3880/3884
Comments	Removable	Fixed	Fixed	Fixed	Fixed

▷ DPS 8 models compete with the Amdahl 580 Series, the new Burroughs V Series, IBM's 308X and 4300 Series, the NAS 8000 and 9000 Series, NCR V-8600 Series, and Sperry 1100.

As the DPS 8 Series reaches the end of its product cycle, Honeywell's biggest problem, no doubt, will be to head off customer defections to IBM. Earlier this year, IBM made the medium-scale mainframe market more interesting when it introduced four new 4381 mainframes and immediately withdrew from marketing three previously offered 4381 models. IBM claimed the new 4381 Series, which includes the Model Groups 11, 12, and 13 single processors, and the Model Group 14 dual processor, offer better price/performance than the previously offered models. The new models feature main memories ranging from eight to 32 megabytes and sell for between $185,000 for the low-end Model Group 11, to $855,000 for the Model Group 14. By contrast, the top-end DPS 8/70 model, configured with a second CPU, costs $1,275,000, substantially more than the 4300 Model Group 14 dual processor.

The DPS 8/70 with a maximum of 64 megabytes also competes with IBM 308X models; however, this product line is also approaching the end of its product cycle. Last February 11, on the same day IBM announced new 4381 models, the industry leader also announced the new 3090 Models 150 and 180, two single-processor, entry-level models that feature a minimum of 32 megabytes of main memory, expandable to 64 megabytes.

ADVANTAGES AND RESTRICTIONS

The DPS 8 processors with their multiprocessor and full-redundancy capabilities can be an asset for organization heavily engaged in interactive processing. The ability to add processors enhances transaction efficiency and increases the number of simultaneous executions that can be performed.

Perhaps the biggest DPS 8 drawbacks are the use of three incompatible operating systems and a lack of third-party application software for these operating systems. Despite these problems, Honeywell has achieved its greatest success with the GCOS/GCOS 8 product line. Of course, this has been little solace to Multics users who account for a tiny percentage of the Honeywell customer base. Because of poor market penetration, Honeywell announced it plans to ▷

▶ IOM with 20 channel slots. An additional CPU can be configured with the DPS 8/47 and up to three additional CPUs can be configured with the DPS 8/49. One additional SCU and IOM can be configured on the DPS 8/47 and 8/49 to provide a tandem system with all central system units cross-connected. The CP-6 models, DPS 8/47C (CPS8119) and 8/49C (CPS8121), have 12 megabytes and 16 megabytes of memory, respectively. Memory on all DPS 8/47 and 8/49 models can be increased to 32 megabytes. All systems are field upgradable.

The central cabinet can include one MSP8000 or MSP8002, and only one MFP8001, MTP8001, or URP8001, since these three units are mutually exclusive. With the addition of a second IOM on the DPS 8/47, 8/47C, 8/49, and 8/49C, additional integrated peripheral processors can be added in the second cabinet. Additional freestanding peripheral processors can be added as desired.

The DPS 8/52, DPS 8/62, and DPS 8/70 each have a freestanding central system. The DPS 8/52 (CPS8181), DPS 8/62 (CPS8186), and DPS 8/70 (CPS8189) have four megabytes of main memory each, one CPU, one IOM with 36 available slots (an optional unit provides up to 54 slots), and one System Control Unit. Memory on these large systems can be increased in increments of two megabytes (CMM8020) on all processors. Maximum memory capacity for the DPS 8/52, 8/62, and 8/70 operating with GCOS is eight megabytes. When operating with GCOS 8 and Multics the maximum is 32 megabytes in the DPS 8/52, 8/62, and 64 megabytes in the DPS 8/70 and 8/70M. The DPS 8/52 and 8/62 can all be field upgraded, all the way to the DPS 8/70. The DPS 8/52 and 8/62 can support up to four Front-End Network Processors (DCU6661/8010) and four System Consoles (CSU6601, CSU6004, or CSU6005). Up to two CPUs, SCUs, and IOMs are offered for the DPS 8/52 and 8/62.

The DPS 8/70 can support up to eight FNPs and four System Consoles, using the same peripherals as above. The system is expandable to four CPUs, four IOMs, and four SCUs. The DPS 8/70M supports up to six CPUs, two IOMs, and four SCUs. Honeywell recommends multiple System Control Units for optimal performance.

For CP-6 the DPS 8/52C, 8/62C, and 8/70C each have a freestanding central system. The DPS 8/52C (CPS8173), DPS 8/62C (CPS8174), and DPS 8/70C (CPS8178) have 16 megabytes of main memory. Each has one CPU, one IOM with 36 available slots (expandable to 54 slots), and one SCU. Memory on each of these large processors can be increased in increments of two megabytes (CMM8020) up to a maximum of 64 megabytes. The DPS 8/52C and 8/62C can all be field upgraded to the DPS 8/70C. The DPS 8/52C, 8/62C, and 8/70C can have three additional SCUs and three additional IOMs. The DPS 8/70C can have up to five additional CPUs. Up to 16 Datanet 8/C Front-End Network Processors can be supported by the DPS 8/52C, 8/62C, and 8/70C. One FNP is included with each system. ▶

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TABLE 3. INPUT/OUTPUT UNITS

Magnetic Tape Units	Number of Tracks	Recording Density, Bits/Inch	Encoding	Tape Speed Inches/Sec.	Transfer Rate, Bytes/Sec.
MTU0410	7 9	556/800 800/1600	NRZI NRZI/PE	75 75	31,000/45,000 60,000/120,000
MTU0411	7 9	556/800 800/1600	NRZI NRZI/PE	75 75	31,000/45,000 60,000/120,000
MTU0412	7 9	556/800 800/1600	NRZI NRZI/PE	75 75	31,000/45,000 60,000/120,000
MTU0610	9	800/1600/ 6250	NRZI/ PE/GCR	200	160,000/320,000/ 1,250,000
MTU0630	9	800/1600/ 6250	NRZI/ PE/GCR	75 or 125	60,000-100,000/ 120,000-200,000/ 468,700-781,200
MTU8205/6/8	9	800/1600/ 6250	—	125 or 200	100-160K/200 320K/781.2-1250K

Printers	Printing Speed	Print Positions	Horizontal Spacing, Chars./Inch	Vertical Spacing, Lines/Inch	Form Size, Inches
PRU0903	900 lpm	136	10	6 or 8	4 to 19 width, 3 to 11 length
PRU1203	1200 lpm	136	10	6 or 8	4 to 19 width, 3 to 11 length
PRU1600	1600 lpm	136 or 160	10	6 or 8	4 to 19 width, 3 to 11 length

phase out Multics at some point rather than develop a planned follow-on Multics hardware product. At some future date, Honeywell officials said current Multics customers will be able to migrate to a new Honeywell computer generation that will incorporate Multics elements. This means customers with heavy investments in Multics software will have to wait a few years and take their chances with a new non-Multics Honeywell system or else leave the Honeywell fold and convert to another product line. Without a doubt, either option will be unacceptable to many Multics users.

The news for CP-6 customers, another tiny user group, looks a bit brighter. Honeywell has now added CP-6 support at the DPS 90 level, making it possible for these users to migrate to a larger system beyond the DPS 8 Series. Up until last year only GCOS 8 users could migrate to larger Honeywell systems.

The latest GCOS 8 product, Release 2500, incorporates TP-8, a new transaction processing product, and also supports the larger capacity tape and disk products. The primary improvements in GCOS 8, over GCOS III are the use of virtual memory, improved security mechanisms, and the increased number of concurrent operations supported. GCOS supports up to 55 operations, to GCOS 8's 477. Processors currently running Version 2500 of GCOS 8 can be upgraded to larger DPS 88 or DPS 90 processors as processing and capacity needs grow. DPS 90 Series is Honeywell's top-of-the-line processor series.

The other operating systems come with distinct advantages of their own. Multics, for instance, provides a high level of

Most peripherals and freestanding peripheral processors available on the Level 66/DPS systems are compatible with the DPS 8/52, 8/52C, 8/62, 8/62C, 8/70, 8/70C, and 8/70M.

INPUT/OUTPUT CONTROL

The Input/Output Multiplexer (IOM) or Input/Output Processor (IOP) coordinates all input/output operations between the system control unit, peripheral subsystems, and Datanet 6661, Datanet 8, or Datanet 8/C Series Front-End Network Processors (FNPs) and document processors. The IOM works with 8/47 and 8/49 systems, while the IOP works with the larger 8/52, 8/62, and 8/70 systems. Data transfers between peripheral devices and memory are also handled by the IOM or IOP. The IOP is sized to handle the MSU3380 disk products and the MTS8200 magnetic tape products that are attachable to only the 8/52, 8/62, and 8/70 systems. All peripheral device operations are controlled by processor-prepared control word lists stored in reserved IOM positions in memory or in the IOM scratch pad memory, except DPS 6 peripherals that are controlled via the Datanet 8/C in DPS 8/C systems.

The IOM consists of the IOM central and a variable number of channels. The IOM central controls access to storage for each of the channels and can perform one storage access cycle at a time through the appropriate system control unit. The IOM central is time-shared by a number of channels operating concurrently.

The IOM contains scratch pad storage which provides higher speed servicing of data transfers through the data channels and reduces the number of data accesses required for control word retrieval and updating.

The Peripheral Subsystem Interface (PSI) channels provide connection between the IOM and various peripheral controllers. Multiple logic channels (up to eight) can be as-

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▷ security through a hardware-based ring structure with different levels of system access. This capability is a big advantage in government and military applications where a high degree of security is a must. New security features built into the MR 11.0 release have earned for Multics a DOD B2 security rating, the highest rating achieved for a large-scale, general-purpose operating system.

Multics is a multipurpose operating system that can concurrently support 40 to 400 concurrent users. It uses virtual memory and can simultaneously support batch processing, remote job entry (RJE), time-sharing, on-line remote data entry and data base inquiry/updating, word processing, electronic mail, program development, and graphics.

The CP-6 operating system, an upgrade of the Xerox-based CP-V facility, is used on the DPS 8/47C through 8/70C. CP-6 supports interactive time-sharing, on-line transaction processing, local and remote batch processing, and distributed realtime processing. The DPS 8/70C using CP-6 can support up to 500 time-sharing users simultaneously.

Whatever inherent advantages each of the three operating systems have, customers continue to complain about the availability of application software from Honeywell and third-party vendors.

USER REACTION

Thirty-four Honeywell DPS 8 users responded to Datapro's 1985 survey of general-purpose computer users. Of those responding, five installed a DPS 8/70, one installed a DPS 8/62, one installed a DPS 8/52, six installed a DPS 8/49, and two installed a DPS 8/47. Among users who've installed CP-6 operating system models, one installed a DPS 8/70C, and one installed a DPS 8/49C. The others were using previously offered models within the DPS 8 Series. These included the DPS 8/41, 8/44, 8/44D, 8/50, and 8/50C. Most respondents said they used some version of the GCOS operating system, while four said they used the CP-6 operating system. None reported using Multics.

The DPS 8 processors examined in the survey were installed between the years 1978 to 1985, although most users surveyed installed a DPS 8 system between the years 1982 and 1984. These DPS 8 users formerly used an interesting variety of now defunct systems before converting to their current system. Former systems mentioned at least once included the DECsystem 20, the NCR 200, the RCA 45, the IBM 370/155, and the GE 6351. Other systems included old Honeywell models, the most often mentioned of which was the Level 66.

Current DPS 8 users were concentrated mostly among three industries. Eight systems were placed in Manufacturing, seven in Government-related sites, and seven in Education. Among other industries checked off, three listed Service Bureaus, three Health Care/Medical, and two Insurance. Industries checked off at least once were Publishing, Utilities, Banking/Finance, and Retail/Wholesale.

The three most prominent applications among the 34 DPS 8 sites were accounting and billing, payroll and per- ▷

signed to a single PSI channel for concurrent multiple unit operation. The PSI channel can transfer data at up to 1,600,000 bytes per second.

Total data rate is either 675,000 words (2,700,000 bytes) per second or 1,000,000 words (4,000,000 bytes) per second, depending on the processor model.

All IOM operations are performed asynchronously with program processing. Interference occurs only when two or more IOMs or processors attempt to access the same main storage module.

The DPS 8 uses several peripheral processors: mass storage processors, a multifunction processor (which handles tape units, card readers/punches, and printers) available only on the 8/47, 8/49, 8/47C, and 8/49C, and separate magnetic tape and unit record processors. The DPS 8/47 and 8/49 can be configured with either integrated peripheral processors contained within the central system cabinet, freestanding peripheral processors, or a combination of both. The DPS 8/52, 8/62, and 8/70 can be configured only with freestanding peripheral processors. All systems can have a front-end network processor to support a variety of remote devices and communications links.

MASS STORAGE

For information about disk storage devices, please refer to Table 2.

INPUT/OUTPUT UNITS

For information about magnetic tape subsystems, unit record subsystems, and printers, please refer to Table 3.

TERMINALS

For information about terminals, please refer to Table 4.

COMMUNICATIONS

The *Datanet 6661 Front-End Network Processor (FNP)* provides large-volume network communications capabilities for DPS 8 systems. The Datanet 6661 incorporates an independently programmable computer with an instruction repertoire of 98 single-address instructions. The CPU in the Datanet 6661 is a solidstate, interrupt-driven, 18-bit unit operating asynchronously under firmware control. The DCU6661 comes standard with 64K bytes of memory and is expandable to 512K bytes. The DCP6661 has two performance enhancement packages rated at 47 and 82 percent. Multiple FNPs can be configured.

A high-speed cache memory is optional in the DCU6661, which provides an execution rate of up to 1,000,000 instructions per second given the appropriate configuration and optimum instruction mix.

The FNP input/output multiplexer (IOM) performs all operations required for the transfer of data between I/O devices and the FNP memory. A data transfer rate of up to 2,000,000 bytes per second is possible. The IOM is connected to the I/O bus, to which various devices are attached. These units are the System Support Controller for the console and network processor diskette; the Direct Interface Adapter, which connects to the host; and the Peripheral Interface Adapter (optional) for access to the host's mass storage processor, when required. The remaining I/O connections are for the Channel Interface Bases, through which the network devices enter the system.

The Channel Interface Base (CIB) provides the line interfacing arrangements necessary to accommodate terminals with various data transfer rates, bit orders, bits per charac- ▶

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TABLE 4. TERMINALS

MODEL	VIP 7814	VIP 7815-7817 and 7824-7827	VIP 7823/7831	VIP 7201	VIP 7301/ 7303/7307	VIP 7305
DISPLAY PARAMETERS						
Max. chars./screen	2000	2000	2000	1920	2000	2000
Screen size (lines x chars.)	24 x 80	24 x 80	24 x 80	24 x 80	25 x 80	25 x 80
Symbol formation	7 x 9 dot matrix	7 x 8 upper/ 7 x 9 lower	7 x 8 dot matrix/ 7 x 9 lower	7 x 11 dot matrix	7 x 9 dot matrix	7 x 8 upper/ 7 x 9 lower
Character phosphor	P31 green std.	P31 green	P31 green	P31 green std.	P31 green std.	P31 green std.
Total colors/no. simult. displayed	—	—	—	—	—	—
KEYBOARD PARAMETERS						
Style	Typewriter	Typewriter	Typewriter	Typewriter	Typewriter	Typewriter
Character/code set	128 ASCII	128 ASCII	128 ASCII	128 ASCII	128 ASCII	128 ASCII
Detachable	Std.	Std.	Std.	Std.	Std.	Std.
Program function keys	12 std.	12 std.	12 dual std.	7 std.	12 std.	12 dual std.
OTHER FEATURES						
Buffer capacity	3 pages	3 pages	3 pages	1 page	1 page	1 page
Tilt/swivel	Tilt opt.	Tilt opt.	Tilt opt.	Tilt opt.	No	Tilt opt.
Graphics capability	—	Std.	Std.	—	—	Std.
TERMINAL INTERFACE	RS-232-C	RS-232-C or RS-442-A	RS-232-C or RS-422-A	RS-232-C or RS-442-A	RS-232-C, RS-422-A, 20 ma, or MIL-188-C	RS-232-C or RS-422

▷ sonnel, and order processing and inventory. These applications continue to be the biggest single commercial applications among all users surveyed last year. Other major applications were purchasing, education, manufacturing, mathematics/statistics, sales and distribution, and engineering/scientific. Applications not mentioned as often included health care/medical, insurance, construction/architecture, petroleum, banking, and process controls.

Cobol continued to be the most widely used programming language. Additionally, an overwhelming majority (87.50 percent) used a data base management system, while another 3.31 percent planned to install one. Virtually all said they used Honeywell's DM IV data base management software product. In the communications area, 48.28 percent said they used a communications monitor, while 6.90 percent said they planned to shortly, and some 44.83 percent said they don't plan to. Of those now using a monitor, most said they used Remote Terminal Supervisor II (GRTS-II) or some related Honeywell product.

Datapro contacted four users out of the 34 surveyed for additional thoughts and comments. Although most agreed the central system hardware was basically reliable, all four said their biggest problem was the availability of good Honeywell application software and third-party software. Each of the four selected Honeywell for different reasons. A government user in New Jersey installed a DPS 8/44 in 1982 after accepting Honeywell as the lowest bidder. Another government respondent in Colorado installed a DPS 8/49 in 1984 because the system ran existing Honeywell applications. A Pennsylvania steel company installed its first Honeywell system in 1973 because it was considerably cheaper than a comparable IBM system at the time. The firm has since migrated to a Honeywell 8/70. A maker of medical instruments in California installed a DPS 8/70C operating under the CP-6 operating system in 1983. This firm switched from a DECsystem 20 to the CP-6 operating system because data processing people were looking for a system tailored to time-sharing applications. ▷

▷ ter, information codes, character sets, message formats, and communications control procedures. Terminals in the low-, medium-, and high-speed ranges can be supported, with a maximum of 72,000 bps possible. In addition, synchronous, bisynchronous, and asynchronous transmissions and any combination of half- and full-duplex modes are supported. Each Channel Interface Base can handle up to eight communications lines, in various configurations. The DCU6661 can accommodate up to 12 CIBs.

The *Datanet 8 Front-End Network Processor (FNP)* is designed for use in communication networks conforming to the Distributed Systems Architecture (DSA) and operates under the control of the Distributed Network Supervisor (DNS) and GCOS 8. The Datanet 8 (DCU8010) is not compatible with the Datanet 6661, but can coexist with it on the same system. A maximum of four DPS 88 host connections can be configured enabling the Datanet 8 to be shared by four DPS 88 host systems.

The base Datanet 8 includes 512K bytes of memory (expandable to 1536K) and a 512K-byte diskette (a second 512K diskette is optional). It can accommodate from 16 to 128 communication lines. The DPS 88 Host connection (DCE8015) is a required addition.

The Datanet 8 can be configured with 2, 8, or 16 DCF8007 Channel Interface Bases (CIB) depending on the line configuration. Each CIB supports up to four channel interfaces, each of which, in turn, supports either one or two communication lines, depending on the specific type of Channel Interface chosen. The following options are available on Datanet 8 systems and can be field-installed:

- Dual Asynchronous Channel Package, EIA RS-422-C, to 9600 bps each (DCF8009)
- Dual Bisynchronous Channel Package, EIA RS-232-C, to 9600 bps (DCF8018)
- Dual Asynchronous Channel Package, MIL-188-C, to 9600 bps (DCF8015)
- Single Synchronous Channel Package, MIL-188-C, to 9600 bps (DCF8014)
- Single Synchronous HDLC Channel Package, MIL-188-C, to 9600 bps (DCF8017)
- Single Synchronous HDLC Wideband Channel Package, MIL-188-C, to 56K bps (DCF8016)
- Channel Interface Base (DCF8007); accommodates up to four Channel Interface Options ▶

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▷ A DP official at the New Jersey government agency said his Honeywell DPS 8/44 system did not accomplish what he was expecting, and he is now moving many applications to an IBM 4361. When the agency purchased the machine, officials were hoping Honeywell would follow through on plans to develop a financial package for them, but these plans fell through. The DP department was forced to come up with an alternate plan involving the IBM system. "When we first installed the (Honeywell) system, we had a lot of problems," said the official. A government system analyst said Honeywell needs to produce more application software or encourage third-party efforts. The government installation also had mechanical problems with the Honeywell MSU501 disk drive.

The second government user said his DP department has similar problems with the lack of available applications software. "We have nothing against the hardware. It's very reliable. But there's not much third-party software and vendor software is inadequate."

The steel company official echoed these software complaints. "Their software isn't as sophisticated as IBM's, and they don't have enough third-party software. At the time they brought it out, it was very good software, but they haven't competed very well against IBM in the last 10 years." The user said his firm would probably not stay with Honeywell.

The fourth contacted user who installed a CP-6 system said his firm moved from an old DECsystem 20 to the Honeywell DPS 8/70C system to run time-sharing applications. CP-6 systems, which come packaged with a front-end network processor and more memory than GCOS systems, are designed around such applications. The CP-6 user said the Honeywell system has presented problems. "CP-6 is not very easy to use," he said. He said he presented Honeywell with a 12-page memo listing a number of perceived technical deficiencies. Specifically, he said it's impossible for users to retrieve deleted files. If a file should be deleted accidentally, it's gone forever, he explained. Additionally, the system will not read past a bad spot on a magnetic tape. He also mentioned speed-degradation in certain types of data transfers. In conclusion, he said his users missed many of the features available with their former Digital Equipment Corporation system. When the Honeywell lease runs out, he said his firm will more than likely go back to a Digital Equipment system. "We're going to give the hardware back to Honeywell and move to a VAX," he said.

Users were asked to rate their DPS 8s in 14 categories covering hardware, software, and vendor support. Compared to the 1984 user ratings taken from an sample of equal size, 1985 users gave their DPS 8s somewhat lower ratings in most categories. In such categories as Ease of operation, Reliability of system, Operating system software, and Compilers and assemblers, 1985 users rated their systems somewhat higher than those surveyed in 1984. In remaining categories, 1985 users gave their systems either equal or lower marks compared to last year's ratings. The lowest ratings were given to application software and docu- ▷

▶ • Dual Synchronous EIA RS-232-C Channel, to 9600 bps (DCF8011)
• Dual Asynchronous EIA RS-232-C Channel, to 9600 bps (DCF8012)
• Single HDLC EIA RS-232-C Channel, to 9600 bps (DCF8020)
• Single HDLC Wideband Channel, to 56K bps (DCF8022)
• Single HDLC Wideband Channel, V.35, to 56K bps (DCF8023)
• Direct Connect Capability (DCF8024) for one Asynchronous or one Synchronous Line, to 9600 bps
• Universal Modem Bypass (DCF8026), Synchronous to 20.8K bps or Asynchronous, to 1800 bps
• Two Asynchronous Current Loop Channels, to 9600 bps (DCF8036)

SOFTWARE

OPERATING SYSTEM: The Honeywell *GCOS 8 (General Comprehensive Operating Supervisor 8)* is the primary DPS 8 operating system. Introduced in 1979 with the DPS 8 systems, GCOS 8 is a product with a genesis dating back to the early 1960s. GCOS 8 is a multiprocessing, multiprogramming, communications-oriented operating system that supports distributed systems requirements. Honeywell's objective is to keep the operating system dynamic by a series of planned releases which capitalize on new technology while preserving the user's investment in software. Honeywell's direction for distributed systems is toward the eventual linking of an organization's entire complex of physically separate data processing systems into a single logical network system regardless of physical boundaries.

According to Honeywell, current GCOS users can upgrade to GCOS 8, and user programs (with few exceptions) that have been running under GCOS will run unchanged under GCOS 8. The latest GCOS 8 release offered for all Honeywell large-scale processor lines from the DPS 8 and DPS 88 to the top-end DPS 90 is GCOS 8 Release 2500. Migration to the new release from Release 2300, the former GCOS 8 version, can be accomplished without the need to recompile application software. The newest release supports an enhanced transaction processing facility, TP-8, and new large-scale disk and tape subsystems.

GCOS 8 is a user-defined and user-oriented virtual operating system, with multidimensional capabilities. It is a batch system, a time-sharing system, and a transaction processing system. GCOS 8 balances the use of system resources, and gives multiple options for customizing the system for each user's needs. GCOS 8 concurrently supports 1) batch processing, 2) remote job entry (RJE), 3) interactive remote job entry (IRJE), 4) time-sharing, 5) transaction processing, 6) direct program access, 7) on-line test and diagnostics, 8) on-line program test and development, and 9) electronic mail.

Additionally, the operating system features multiprogramming, multiprocessing, and flexible job entry capabilities. GCOS 8 also has file protection and file sharing, testing and diagnostics, communications, time-sharing, data management facilities, language processors, diagnostic and system protection facilities, and various system utilities. Batch, time-sharing, transaction processing, and other activities can be individually tailored and dynamically varied throughout the day. Peripherals are allocated before memory so that processing is not delayed by operator or mechanical delays.

GCOS 8 is a flexible operating system that features hardware transparency, meaning that the user has no need to know the particular architecture of the system, its hardware, I/O devices, or processor types. All processors can access all of memory and can execute any program. Up to 477 user programs of up to one megabyte each can be executed concurrently. GCOS 8 provides high throughput by efficient ▶

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▷ mentation, two usual vendor weak spots. Interestingly, users surveyed in 1984 and 1985 gave the DPS 8 the same rating in Overall-satisfaction category, 3.03.

	Excellent	Good	Fair	Poor	WA*
Ease of operation	10	21	1	—	3.28
Reliability of system	20	10	2	1	3.48
Reliability of peripherals	6	21	5	1	2.97
Maintenance service:					
Responsiveness	14	18	2	—	3.35
Effectiveness	5	25	3	1	3.00
Technical support:					
Troubleshooting	3	22	8	1	2.79
Education	4	17	11	2	2.68
Documentation	3	13	15	3	2.47
Manufacturers software:					
Operating system	19	9	4	1	3.39
Compiler & assemblers	12	18	3	—	3.27
Application programs	—	11	12	5	2.21
Ease of programming	7	19	5	1	3.00
Ease of conversion	7	12	8	3	2.77
Overall satisfaction	6	22	5	—	3.03

*Weighted Average on a scale of 4.0 for Excellent.

When asked if their computer systems performed as expected, 30 respondents said "Yes," two said "No," and one was undecided. When asked if they would recommend their systems to other users, 28 said "Yes," three said "No," and three were undecided. □

▶ and rapid scheduling of all activities, which reduces operator intervention.

GCOS 8 memory management is flexible. The system architecture with GCOS 8 provides dynamic memory management, descriptor-controlled access, and shared access to both data and procedures. Each of these functions is based on a hardware-protected memory segment. The memory segment is defined by a segment descriptor that contains the logical address of the beginning of the segment, the size of the segment, and the permissions that control its use.

Dynamic memory management permits programmers to develop software as if there were an unlimited logical memory. The available physical memory, on the other hand, depends on the system configuration and the workload.

GCOS 8 controls the physical organization of up to four million pages of real storage with each page consisting of 4096 bytes. CGOS 8 can use as many as 477 separate working spaces (out of 512 total working spaces) at any time for memory allocation and control.

Any available page of main memory can be used for any page-sized block of logical memory. Although pages may be located anywhere in memory, they can be accessed as if they were physically contiguous. With memory access, segment descriptors and page table words translate the virtual address to a main memory address.

Hardware and software system security is provided in several ways. The operating system will abort an activity if an illegal operation is received. The File Management Supervisor provides a common file system for all DPS 8 operating dimensions as well as protective and restorative functions to ensure file integrity. Access to files is controlled through several levels. Files are grouped in a hierarchical order by user name, access restrictions, and resource control. File names are qualified by comparing them to the user names under which they are cataloged. Passwords may be required as an additional form of user identification. Access to files is

under the originator's discretion and control. Each user can have a multilevel hierarchical subcatalog structure with the ability to assign access controls and passwords at each subcatalog level. Another safeguard is a hardware implementation that controls access to sets of memory segments called domains. This structure protects programs and files from intentional access by unauthorized personnel and unintentional access during debugging procedures.

The DPS 8/C computer systems use the *(Control Program)* CP-6 software and operating system. CP-6 is a Honeywell enhancement of the Xerox-developed CP-5 operating system used on the larger Xerox processors. CP-6 includes facilities for interactive time-sharing, on-line transaction processing, and multiprogrammed local and remote batch processing.

CP-6 provides a memory mapping system for up to 512 program working spaces and for addressing up to 16 megawords. User instruction segments can be up to 224,000 words, while data segments can be up to 384,000 words. CP-6 also provides three-level protection for user context segments and hardware management.

System overhead is reduced by an event-driven scheduler designed to help provide a higher percentage of CPU cycles available for user-related activities. Communications processing is distributed to local and remote front-end processors based on Honeywell's current minicomputer technology. CP-6 takes advantage of DPS 8 large-memory technology with addressing to 64 million bytes to facilitate rapid response to on-line interactions.

The complete CP-6 system provides a single program interface to all services, and an extensive array of productivity features including on-line program development and debugging, high-level, advanced programming languages, data base management systems, friendly terminal user interfaces, an on-line HELP facility, and a query and report language.

CP-6 provides a common command language that is used for initiating and controlling tasks in all processing modes. This design helps simplify program development activities and helps facilitate transportability of programs from one mode to another.

The operating system can support up to 500 current time sharing users, while the multiprogramming batch processing facility can process up to 500 batch streams concurrently. Batch jobs may be submitted to the system through a central site card reader, from an on-line terminal, or from a remote site via the remote batch facility. The spooling system can help improve throughput by eliminating bottlenecks associated with slow-speed unit record peripherals. All batch jobs form a priority-ordered queue and are processed when program-specified resources become available. Remote batch processing permits flexible communications between CP-6 and a variety of remote terminals. These terminals can range from a simple card reader/card punch/line printer combination to other computer systems with varieties of peripheral devices. CP-6 can communicate as a host system with many terminals and computers at various sites and simultaneously act as a remote terminal to other computers.

The DPS 8/70M computer system uses Honeywell's *Multics* operating system. Multics is a specially designed virtual memory operating system that offers remote terminal access as the primary means of entering the system, multiprocessing with dynamic reconfiguration capabilities, and a unique hardware-based ring structure that provides security for sharing of programs and data. It also has a tree-structured hierarchy for organization of user and system structure, and the availability of multiple programming environments and user interfaces within a single system. It accommodates batch and time-sharing through a common command language, and is written primarily in PL/1. ▶

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The latest releases of Multics are MR 11.0, introduced in 1985 and MR 12.0, which will be shipped during mid 1986. These releases succeed two previous Multics releases, MR 10.0 and 10.2. As part of the new releases, enhancements were made to transaction processing capabilities, data base software, and the C compiler. Other enhancements involve support for larger capacity 3380 disk drives, purchased on an OEM basis from IBM, and PC support. Another major improvement centers around operating system security features. Because of this work, the operating system has earned a U.S. Department of Defense B2 security rating.

Information in the Multics system's virtual memory is organized in variable-length segments. Each segment can contain either programs or data or can be a directory; i.e., a catalog of related segments represented in tree structure. Segments are directly addressable by a symbolic name. The Multics hardware uses a segment descriptor to determine the absolute address of the segment and its access attributes. Any word, character, or bit within a segment can be referenced by its location within the segment. Segments can reside anywhere in main memory and can alter their size independently of other segments.

Multics uses demand paging to determine which portions of a segment are to be present in main memory. Segments are automatically divided into fixed-size pages of 1,024 words, and paging is performed automatically by the Multics hardware, so that only the currently accessed pages of a segment are required in main memory.

All input/output operations are performed automatically by Multics. The programmer is required to supply the symbolic name of the segment and the address of the desired item within the segment, or the relative address stated in the terminology of a higher level language. A device-independent input/output system is available that permits interchangeable reading and writing on magnetic tapes, communication terminals, cards, printers, and storage system segments through the use of symbolic names. User output can be automatically queued for printer or punched card output. User-written input/output routines can also be accommodated by the system.

Controlled sharing of programs and data is facilitated by the Multics ring structure, a unique security scheme that is implemented as an integral part of the segmentation and paging scheme. The ring structure in conjunction with the segment access control list permits programs to access another owner's data base only through an owner-supplied program that specifies what data can be referenced and what operations can be performed.

GCOS PROGRAMMING LANGUAGES: Language processors available on DPS 8 systems under GCOS 8 are Cobol-74, Cobol-68, Fortran-66, Fortran-77, PL/1, GMAP, GPSS, Basic, data Basic, Simscript, Pascal, Compiler "B," Lisp, APL, and RPG II.

CP-6 PROGRAMMING LANGUAGES: CP-6 language processors include ANSI Fortran, Cobol-74, APL, Basic, RPG II, and PL-6.

MULTICS PROGRAMMING LANGUAGES: Languages available to Multics users include PL/1, APL, Cobol-74, MRPG, Fortran-77, Basic, C, and ALM (Assembly Language for Multics).

GCOS DATA BASE MANAGEMENT: The GCOS 8 *DM-IV Data Manager* component of *Data Management-IV* handles the data base management functions. Data Manager, also referred to as *Integrated Data Store/II (I-D-S/II)*, administers the creation of the physical and logical structures of the data base and controls the creation of the

application-specific views of that data base which are used in processing. It further serves as the interface between the data base and the various DM-IV processors that access the data base and perform operations upon it.

The I-D-S/I and I-D-S/II systems are enhanced versions of I-D-S, a data base management system originally developed by General Electric Co. I-D-S/II is based on the CODASYL Data Base Facility specifications. I-D-S/II is fully integrated with Honeywell's Cobol-74 compiler, and user interfaces are also implemented for Fortran.

Relational Access Manager, which allows interface to many standard file types, adds a relational access to nonrelational data bases. The facility accomplishes this without restructuring data files or programs. The user-friendly facility lets nontechnical and technical users access data through a simple command structure.

CP-6 DATA BASE MANAGEMENT: CP-6 operating system users also use I-D-S/II, a data base management system that can be a combination of singular, tree, hierarchical, and network structures. The system can contain up to 68 billion records. Other CP-6 data base components include *Data Manipulation Language*, a procedural language for jobs accessing the data base, and *Data Definition Language*, a high-level language that is used to describe the areas, sets, records, and data items of the data base.

A Relational System (ARES), also used under CP-6, is a data base management system designed for both programmers and nonprogrammers. Under ARES, data are arrayed in tabular row-and-column formats. ARES commands are submitted through transactions. Data can be stored, accessed, and updated using Data Manipulation Language. Commands can be executed as a onetime inquiry and discarded, or they can be stored as part of the data base description and executed as needed. Data Definition Language lets users define the data base and change its structure.

GCOS DATA MANAGEMENT: Data Management on Honeywell GCOS systems is handled through Data Management-IV (DM-IV), a product containing a collection of facilities to handle data base management, transaction processing, querying, and report processing in addition to providing batch and interactive data base capabilities. (Data base management capabilities are detailed in the Data Base Management section above.) Other facilities featured under data management include the Data/Dictionary/Directory System (DD/DS), File Management Supervisor, Indexed Sequential Processor, Unified File Access System (UFAS), Management Data Query System, TOTAL Central, and Common Files Facility (CFF).

DM-IV has evolved from earlier software systems such as Integrated Data Store-I, Transaction Processing System, Transaction Driven System, and Management Query System. DM-IV is a fully operational on-line, integrated data base management system. Data extraction and updating from data bases with various file organizations and data structures can be directly performed by nondata processing professionals. DM-IV consists of the following functional modules: the Data Manager (described in the Data Base Management section), the *Transaction Processor*, the *Query and Reporting Processor*, and the *Procedural Language Processor*. It also supports batch and time-sharing programs.

The DM-IV Transaction Processor (TP) provides the facility for rapid, efficient, on-line data base processing. It is most effectively used in applications where the end user has little or no knowledge of the operating system or storage structure, or data processing in general. Its internal design is optimized for high-volume transaction processing where extremely fast response and fast, automatic restart/recovery ▶

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are required. The TP system includes both on-line software components for processing the actual transaction and a variety of support software products for program testing, library updating, and TP system generation. Within DM-IV/TP, there are five major functional components: Transaction Manager, Data Base Manager, Integrity Manager, Message Manager, and Executive Manager.

The Executive Manager schedules and coordinates all Transaction Processor activities. It manages the allocation of system resources for transaction processing.

The Transaction Manager controls and coordinates all activities during the processing of a transaction. It initiates each transaction control task which TP processes and controls the communication between application routines.

The Database Manager controls all data base activities for on-line files assigned to TP. The executive software also provides for dynamic allocation and deallocation of data base files to TP for uninterrupted continuous operation.

The Integrity Manager provides for fast, automatic recovery and restart after any type of application or system failure. This includes everything from rollback of the data base after an application program abort to the complete reconstruction of a destroyed data base.

The Message Manager is the executive software component that actually handles the communication interface with the terminal network supported by the Front-End Network Processor (FNP). The Message Manager provides both the physical and logical interface to the on-line network of terminals and handles the acceptance and delivery of input and output messages.

The Data Dictionary/Directory System (DD/DS) is a comprehensive set of software modules that can implement a centralized data dictionary/directory. Data are entered into the dictionary data base via either batch or interactive operations. The DD/DS supports up to 19 entity-types such as fields, records, files, programs, procedures, jobs, schemas, and reports. Multiple versions and status of each entity type, alias names, narrative, and attributes unique to the entity type are also supported.

Several report generation facilities are available to the DD/DS user. The reporting system extracts information from the data dictionary and presents it to the user in various formats. Included is an extensive cross-reference (where used) reporting capability for all entity-type occurrences and an Impact Analysis Report which analyzes and reports the effect of change to an entity-type occurrence. A complete set of utilities is provided to assist in the maintenance of the data dictionary system and its data base.

The *DM-IV Query and Reporting Processor (QRP)* provides the user with several subsystems which act to access the defined data base and its structure and to generate reports on the results of the requested access. The DM-IV QRP end-user facilities provide access to the data base by noncomputer-oriented personnel. Within QRP, simple, straight-line procedures may be written to explicitly retrieve the desired data and process exception conditions such as no data qualifier and end of retrieval conditions.

Example Query (EQ) is an end-user facility consisting of an easy-to-learn language and support program. EQ aids application-oriented users in the queuing of data through the Relational Access Manager, which is included. User interface is through CRT devices (VIP7800), and alternatives to CRT display include printed output and file output. The interactive language facilities are designed for fast and simple formulation of requests which provide answers to application questions. The language has minimal syntax which is easily constructed into graphic representation of user processing requests.

Interactive Query (IQ) is an end-user facility that allows users to interface in nonforms mode with any type of terminal. Included with IQ is the Relational Access Manager, which allows interface to many standard file types.

The *Comprehensive Report Examination/Display Option (CREDO)* is an optional Personal Data Query (PDQ) facility that can format report data generated through the EQ and IQ facilities into refined, individualized reports. CREDO reports are defined, created, examined, and distributed according to user-specified or system-default options.

The File Management Supervisor (FMS) provides file management capabilities, including multilevel user catalogs, file sharing, and access control. The system employs a hierarchical, "tree-structured" design. A System Master Catalog lists the various user Master Catalogs, and each user may, in turn, define one or more levels of subcatalogs. Users may permit general sharing of their files or specify individual users who may access them on either a read/write or read-only basis. Password access control can be imposed at any or all levels of the file structure. Security is also provided by the optional logging of file access attempts and by a time-sharing command allowing a user to encrypt his or her file using a predefined algorithm.

The Indexed-Sequential Processor (ISP) supports the widely used indexed-sequential file organization and access method, which permits mass storage files to be accessed in either random or sequential fashion. For each logical file, ISP maintains a data file and an independent key file, which serves as an index. The key file can be placed on a faster random-access device to speed up the access process.

The Unified File Access System (UFAS) provides automatic management for file processing, including record location and automatic blocking and deblocking. File organizations supported include sequential, relative, indexed, and integrated files. UFAS also includes facilities for error checking and initiation of error processing as defined by ANSI Cobol-74, and file integrity protection for normal and abort processing.

The Management Data Query System (MDQS) is a data management system that permits interrogation of sequential, indexed sequential, or I-D-S/I file organizations. MDQS operates as a subsystem to GCOS in both batch and time-sharing environments, and is available in two versions: MDQS/II, a data base retrieval and report generation system, and MDQS/IV, a system that offers all MDQS/II capabilities plus data base creation and maintenance features.

The Common Files Facility (CFF) controls the sharing of user program and data files between GCOS III and GCOS 8 as well as between GCOS 8 hosts without requiring manual partitioning of data or mass storage devices. The CFF allows a Level 66 or DPS 8 system(s) and a DPS 88 system(s) to share disk files on a single common group of disk drives.

CFF allows up to four computer systems in any mix to share common disk drives. Concurrent access to files is controlled by lock bytes in the mass storage processor that supervises disk drive operation. Locking occurs at the single file level, which ensures that only one computer system in the cluster can update a file at one time. CFF clusters can also exist within communications networks based on Honeywell's Distributed Systems Architecture.

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► **CP-6 DATA MANAGEMENT:** CP-6 data management functions are included within Integrated Data Store/II (I-D-S/II).

Interactive Data Base Processor is a query and reporting language that lets users retrieve and display data maintained in the I-D-S/II data bases on-line or any file that can be read sequentially. Users who may not be data processing professionals can take advantage of the product using English-like commands.

MULTICS DATA MANAGEMENT: The *Multics Relational Data Store (MRDS)* functions as a subsystem of the Multics operating software and makes use of the DPS 8 virtual memory and file management subsystems. MRDS includes such features as a relational interface, programming language independence, data definition and program independence, query capability via LINUS, on-line access and updating, concurrent access and update controls, report generation, and data security maintenance.

LINUS (Logical Inquiry and Update System) is a facility for accessing data bases from a remote terminal. It uses the Multics Relational Data Store (MRDS) for data base access. *LINUS* uses a high-level nonprocedural language called LILA (Linus Language). It also provides these features: a macro facility, line editor for simplifying data expression development, built-in and user-defined functions, a help facility, a report writing capability, and data security.

GCOS DATA COMMUNICATIONS: *Distributed Network Supervisor (DNS)* has been designed specifically for use in the Datanet 8 Processor, and is part of a set of communication software products based on Honeywell's Distributed Systems Architecture (DSA). DNS supports up to four DPS 8 host connections enabling one Datanet 8 to serve multiple hosts.

DNS operates in the Datanet 8 in conjunction with a DPS 8 host running the GCOS 8 or GCOS operating system to provide support for transaction processing, distributed transaction processing, distributed terminal concentration, time-sharing, remote job entry, direct program access, and networks made up of DPS 88s, DPS 8s, DPS 7s, and DPS 6s in any combination. DNS supports private networks, Public Data Networks (PDNs), and Value Added Networks (VANs), including X.25 packet switched and X.21 circuit switched networks.

The administrative functions distributed throughout the various systems that make up the DSA network include network monitoring, cross-network software loading, dumping, data logging for statistics, billing and maintenance, inline tests, and software generation.

DNS supports a variety of terminals such as the Honeywell TWU/PRU 1003, 1005, and 1901; VIP 7100/7200/7201/7700/7700R/7800; and VTS7710. Also supported is the DPS 6-DSA software package that allows a DPS 6 or Level 6 system to function as a distributed processor and to communicate with a DPS 8 host in a DSA network.

The *Network Processing Supervisor* and the DPS 8 support five types of remote processing in any combination: remote job entry (RJE), transaction processing, time-sharing, message switching, and direct program access. RJE is supported by four standard interfaces for remote computers: remote computer interface, remote network processor multimessage interface, BSC interface, and HDLC interface.

The information network is controlled by a combination of the Datanet 6600 Front-End Network Processor and the NPS software, and can range in size from several terminals to a comprehensive, distributed information network with multiple host processing facilities.

NPS supports a wide variety of remote terminals, computers, and communications facilities, such as the Honeywell TWU/PRU 1003 and 1005, Teletype Models 28/33/35/37/38, GE TermiNet 300/1200, Hazeltine 2000, IBM 2741 and 2780, and Honeywell VIP 765/776/786, VIP 7100/7200, VIP 7700/7700R/7760/7800, RNP 702/707, and RNP 6/DPS 6 minicomputers. NPS also provides customization and parameterization facilities to facilitate implementation of additional terminal types and network protocols into the system, journalization of message traffic on mass storage, restart/recovery capability, supervisory control through one or more Network Control Supervisory Stations, statistical recording and reporting, and a high level of line/terminal control through parameterization.

The *Remote Terminal Supervisor II (GRTS-II)* provides controls for five types of remote processing: remote job entry, transaction processing, time-sharing, message concentration, and direct program access. RJE supports the same standard interfaces as NPS. Programming subsystems supported under time-sharing are the same as for NPS. GRTS-II does not support the direct program access communications-queued (DAC-queued) mode provided in NPS, nor does it support any host interface which makes use of the DAC-queued method.

GRTS-II includes a *Communication On-Line Test System (COLTS)* and support for remote terminals and devices with speeds from 75 to 56,000 bps. GRTS-II may coexist with NPS or DNS, each residing and executing in a different network processor. Host-to-host file transmission is supported through the Data Link System.

The *Transaction Processing System (TPS)* invokes the loading and execution of the appropriate application programs for processing transactions received from remote terminals. The Transaction Processing System requires a front-end network processor and can accept transactions from various terminals.

TPS is modular in design and consists of the *Transaction Processing Executive (TPE)*, user-written *Transaction Processing Applications Programs*, the *Transaction Input Interface* at each remote terminal, and the *Interslave Communication (INTERCOM) Facility*. Transaction Processing Applications Programs (TPAPs) can be written in any language processor supported by GCOS 8 including Cobol, Fortran, or GMAP, and are stored in the GCOS file system for activation as required.

TP-8, a new transaction processing facility under GCOS 8 Release 2500, is said to enhance productivity within organizations with heavy transaction processing workloads. The product can be a growth path for DM-IV/TP users who need increased transaction processing performance and functionality, according to Honeywell. TP-8 is compatible with DM-IV/TP and the *Transaction Processing Executive (TPE-II)* (described in the Data Communications section), while also offering several improvements. Using the product, users can tailor transaction processing applications to specific needs. Applications can be implemented through routines and programs written in several languages including Cobol 74 or Fortran. While in execution, each routine or program is processed independently and can access the range of facilities available in GCOS 8. ►

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▶ The *Transaction Input Interface* provides simplified procedures for entering transactions from either teletypewriter or keyboard/display consoles. The INTERCOM facility permits data to be exchanged between the Transaction Processing Executive and applications programs through direct buffer-to-buffer transfers. The Transaction Processing Executive operates as a privileged slave program under the GCOS 8 operating system and is activated by an operator command.

Transaction Driven System (TDS) is designed for high-volume, on-line transaction processing. TDS differs substantially in internal architecture from the GCOS Transaction Processing System (TPS), but it complements TPS by giving a total DPS 8 transaction processing capability. The TDS internal design is optimized for high-volume transaction processing where extremely fast response and fast, automatic restart/recovery are required.

The TDS Executive program executes under GCOS 8 much like the Time-Sharing System Executive. It is an executive operating under GCOS 8 with the major responsibilities of scheduling and coordination of all TDS activities and tasks. TDS manages the allocation of system resources for transaction processing and handles all communications between TDS and GCOS 8.

The DPS 8 *Time-Sharing System (TSS)*, in connection with a Datanet front-end processor, provides time-sharing computing services to multiple users at remote terminals. The system resources allocated to time-sharing can be dynamically varied under operator control. The time-sharing executive, operating as a slave activity under GCOS 8, suballocates storage and dispatches the processor to the programs of individual time-sharing users. Time-sharing on GCOS 8 utilizes the GCOS 8 memory architecture to permit any desired amount of system memory to be allocated to time-sharing. A single copy of TSS can support up to 600 users, assuming enough memory, I/O, and communications facilities are provided. In multiple-processor systems, the time-sharing users' programs can simultaneously use as many processors as desired by the site. A separately priced Multi-copy Support Option allows from two to four copies of the time-sharing executive to run on one DPS 8 system, thereby increasing the number of users that can be supported.

DPS 8 GCOS Time-sharing users have a choice of six major programming languages: Cobol-74, Extended Basic, Pascal, Time-Sharing Fortran-66, Fortran-77, and APL. Time-sharing users can communicate directly with batch-mode facilities, permitting the development and testing of programs, data entry, control of batch program execution, and manipulation of results from remote terminals.

Interactive Integrated Data Store/II (I-D-S/II) provides the ability to interactively update and retrieve information from an I-D-S/II data base. Access is a conversational file management system for creating, deleting, and maintaining catalogs and files and for assigning passwords and accessing criteria. The *FDUMP* facility can be used for inspection and maintenance of permanent files. The *LODT* routine permits execution of experimental user subsystems, including trace analysis and debugging of user programs from remote terminals. The *Time-Sharing Activity Report* provides reports on the accumulated utilization of the time-sharing system resources. *Personal Computing Facility* is now available under time-sharing offering spreadsheet capability.

CP-6 DATA COMMUNICATIONS: CP-6 distributes communications processing functions to local and remote front-end processors that interact with DPS 8 systems through high-speed connections. This configuration enhances throughput and efficiency in the following ways: Front-end systems release additional host processor time for user programs; such systems provide more efficient hard-

ware for specialized tasks and also achieve time-parallel processing. Additionally, more system modularity allows a closer match between customer requirements and installed capacity.

The CP-6 transaction processing environment consists of two elements: the forms program that executes in the communication processor and accepts and verifies the transaction, and the application program that executes on the central system and accesses and updates the data base. These two elements are cooperating processes and result in an efficient design because of the distribution of the executing processes to multiple processors.

The CP-6 transaction processing facilities allow users at remote terminals to enter transactions simultaneously using a common data base. These terminals can operate in character or message mode.

CP-6 is designed to support up to 500 concurrent time-sharing users. The command language can help reduce user training requirements and enhance program transportability. Each time-sharing user can use the comprehensive language and service facilities to create, debug, and execute programs, and to create, modify, and delete files. File and program security are provided for each user.

MULTICS DATA COMMUNICATIONS: *Multics Communications System (Multics CS)*, network processor software for Multics, manages the transfer of data between the central processor and remote equipment through communications channels. Multics CS resides in both the central system and in the network processor. Among its functions, Multics CS supports terminals and hardware of many manufacturers, connects small systems for satellite applications, and provides security on a per-channel basis through access control segments. The facility features built-in diagnostic and dubugging capabilities for increased system availability. Additionally, the facility permits customization of software for specialized user applications and lets administrators monitor and tune system performance.

GCOS PROGRAM DEVELOPMENT: Honeywell offers a number of products that can be put to use as program development tools.

The *Transaction Application Test System (TATS)* is a software tool that provides an interactive time-sharing environment for writing, compiling, testing, and debugging Transaction Processing Routines (TPRs) using a DM-IV (IDS-II) data base. TATS also provides a TPR program skeleton generator, and forms mode support is currently provided for the DM-IV TP Forms Option (TPFO). The TATS package can also be used to interactively verify data base updates and to integrate completed TPRs into the production system.

The *Transaction Screen Management System (TSM)* is a set of tools designed to enhance the development of application programs in a DM-IV TP environment. This system enables the developer to design, develop, test, and implement screen formats for application systems. Little or no knowledge of the communications network or the DM-IV TP operating environment is required.

The optional DM-IV Procedural Language Processor (PLP) is an extension of QRP which provides a high-level, procedure-oriented language for use by application and system programmers. When using the Query and Reporting Processor end-user facilities, the user need not be concerned with the data base structure or access methods. *Syntax Directed Editor (SDE)* is a productivity tool designed to support the ▶

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► creation or modification of Cobol-74 programs. SDE reduces the amount of code that a programmer must enter and immediately checks for format and syntax errors.

System-80 is designed to reduce the time and effort of coding, maintenance, and documentation normally associated with Cobol program development. It includes several functional programs and associated files that interact with the user to acquire needed information about files, fields, screen formats, and validations and edits.

Softool is a set of software tools designed for cost-effective management, development, and maintenance of application software. The Softool Development Environment Product Set offered by Honeywell consists of the Cobol Programming Environment (Cobol-74) and the Change and Configuration Control.

Simscript provides the user with a simulation-oriented language that permits the translation of complex mathematical and logical models into meaningful simulation sequences. It is an event-oriented language with a timing routine that allows the analysis of activities in a controlled sequence in simulated time.

The *General-Purpose Simulator System (GPSS)* is a simplified, simulation-oriented language that establishes mathematical models in order to provide results for further analysis.

The *General Macro Assembler Program (GMAP)* enables the programmer to code either in an open-ended macro language or directly in machine-oriented symbolic instructions.

The *Debug Support System (DSS)* supports batch or on-line debugging of user programs, and can trace programs, display memory contents, and modify memory locations. Object-level debug can be performed with any language. Symbolic debug is supported by Cobol-74, Fortran-77, and PL/1.

CP-6 PROGRAM DEVELOPMENT: CP-6 system aids are distributed in a special account called Account X, which contains approximately 175 user tools. Such tools fall under several categories, including programmer aids, system programmer aids, integration aids, installation management aids, documentation aids, development management aids, and microprocessor support aids.

MULTICS PROGRAM DEVELOPMENT: Multics offers several program development and debugging tools which help programmers develop applications in less time. *Probe* allows programmers to set breakpoints in programs, examine or change the values of program variables, and examine the programs' execution history. *Progress* lets programmers check for loops. *Trace* and *Trace-Stack* allow programmers to examine execution history. *Profile* can detect program inefficiencies.

GCOS UTILITIES: System utilities include a Sort/Merge Facility, the File Generation Facility, FMS Utilities, Visual Information Display for Efficient Operation, Comprehensive System Utilities Facility, and System Utility 8, General Loader, Bulk Media Conversion, and Source and Object Library Editor.

CP-6 UTILITIES: Available CP-6 utilities include *Linker*, *Peripheral Conversion Language (PCL)*, *Sort/Merge*, *Source Editor*, and *Library Maintenance*. Linker performs requested library searches, performs the required linkages,

and produces executable run units. PCL is a media conversion service for moving files in various forms from one peripheral device to another. CP-6 Sort/Merge rearranges the records of a file in predetermined order and combines the records of several ordered files into a single ordered file. The CP-6 Source Editor creates a sequenced source file, copies, and renumbers records of a source file, and inserts, deletes, or replaces a record or sequence of records in an existing file. It also performs character string substitution and manipulation on groups of records within an existing file. Library Maintenance permits individual modules of widely used routines to be added, deleted, copied, or replaced within CP-6 libraries.

MULTICS UTILITIES: Utility programs include text editors, debugging aids, performance measurement tools, inter-user communication facilities to permit messages to be transmitted among users, and on-line documentation of system software and user programs.

OTHER GCOS SOFTWARE: The *Personal Computing Facility (PCF)* is a screen-oriented, interactive system that provides a user-friendly application environment. A person without knowledge of conventional computer programming can use PCF to create any type of VDU or CRT form as a basis for interactive problem solving.

The Honeywell *Error Logging and Analysis (ELAN)* system is a software system that works in conjunction with *System Maintainability/Availability Software (SMAS)*, GCOS 8, and the DPS 8 fault recovery hardware. The Instruction Retry feature attempts to recover from transient errors such as incompleted operations, parity errors, and illegal procedures. The proper Error Analysis and Logging module is called in when a processor or memory module error is detected. After analysis and logging, either the faulted instruction is retried or normal GCOS 8 fault processing procedures continue. The Error Reporting Program is initiated when a hardware error occurs, when the error log becomes half full, or at operator request. Error record is printed, analyzed, and summarized, with summary data retained on an error summary file. ELAN is a key element of the remote diagnostic and testing facilities.

The *Text Editor* permits terminal users to create a body of text, edit it, save it, and print it in a specified format. *TEX* is an interpretive language that integrates the capabilities of the Text Editor with text processing, providing additional verbs and subroutine calls.

OTHER CP-6 SOFTWARE: *TEXT* command language, designed for nonprogrammers, lets users print various types of documents. Available to users in either batch or on-line mode, TEXT permits the merging of separate names and address files with corresponding documents.

Information Resource Management System, available through McCusker-Bearley Associates Ltd. of Azusa, CA, is a generalized information system that provides report writing and data base maintenance capabilities.

AZ7, available through AZREX Inc. of Burlington, MA, is a dictionary-driven, interactive inquiry and report writing system with optional file maintenance capabilities.

VUE, available through National Information Systems Inc. of Cupertino, CA, is an interactive, menu-driven project management system. It supports CPM and precedence project networks, and provides for resource and cost tracking. Up to 3,000 activities per project can be supported, and a multiproject capability is available. ►

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▶ *Computer Assisted Publications (CAP)* includes techniques and programs developed to produce technical manuals and HELP files for customers with in-house publication requirements.

CP-6 Electronic Mail allows users to send and receive messages through terminals without generating paperwork. The system provides capabilities for message viewing and manipulation, message preparation, and message transmission.

Error Logging and Analysis (ELAN) provides logging functions that record hardware and software problems occurring during system operation. The recorded information, formatted for easy interpretation, helps users detect and prevent potential hardware problems.

OTHER MULTICS SOFTWARE: Multics provides support for a comprehensive word processing system, *Wordpro*, which includes editing, error correction, and formatting tools for the on-line preparation of documents. Multics also provides an interactive graphics system, supporting both static and dynamic terminals, that permits creation and manipulation of complex graphics structures. The Multics Off-Line Page Processing System (PPS) feature creates a system output tape that can be printed later on a Honeywell PPS.

Multics also has an *Electronic Mail Facility*. This facility offers its users direct, on-line, person-to-person distribution of text. It handles mail ranging from brief memos to multi-volume documents and delivers that mail immediately to data terminals or on-line mailboxes.

Emacs (Editor Macros) is a text editing and screen management facility that features screen blocking for operator monitoring of more than one activity.

PRICING & SUPPORT

POLICY: DPS 8 equipment, except DPS 8/47 and 8/49, is available for purchase or for rental under a one-year, three-year, or five-year lease. The basic monthly rentals entitle the user to unlimited central processor usage per month with on-call remedial maintenance between the hours of 8 a.m. and 6 p.m. on Mondays through Fridays. For scheduled usage beyond this period, with on-call maintenance service, the user pays an additional charge which is a fixed percentage of the monthly maintenance charge. Alternatively, the user can obtain on-call maintenance service at standard hourly rates of $138 per employee-hour.

The DPS 8/47 and 8/49 are available for purchase or for rental under a one-year or four-year lease. The basic monthly rentals entitle the user to unlimited central processor usage per month with on-call remedial maintenance between the hours of 8 a.m. and 6 p.m. on Mondays through Fridays. For maintenance beyond this period, the user pays an additional charge which is a fixed percentage of the base maintenance charge. For full service coverage (24 hours, 7 days per week) the additional charge is 48 percent of the base maintenance charge.

The GCOS 8 operating system executive (OSE) is provided to DPS 8 users at no additional cost. All other facilities, such as job management, file systems, conversion aids, language processors, utilities, applications packages, communications software, system maintenance, and system performance analysis are separately priced.

SUPPORT: Honeywell offers six categories of support products for DPS 8 systems. These products include data services, system engineering, software, education, publications, and supplies.

Data services consist of machine time for predelivery production and checkout, and for overload/peakload situations. Processor time costs approximately $110.00 per hour, minimum, depending on the amount of memory. Charges for on-line peripherals vary from $4.00 to $12.80 per hour; for off-line peripherals, $10.90 to $29.10 per hour.

Honeywell's Distributed Maintenance Services provides users with remote testing and diagnostic facilities. Headquartered in Phoenix, AZ, DMS Includes a Response Center for toll-free, 24-hour a day contact with Honeywell; the Technical Assistance Center, which coordinates all activities; a Logistics Inventory Data System, for rapid location of parts; Service Account and Field Engineering representatives; an Alert system to notify FE management of special problems; Remote Access Program software for troubleshooting; a systems optimization and monitoring program to evaluate and measure system performance; a network analysis program to solve communications network problems; and automatic software updating.

EDUCATION: Education services include standard courses, advanced professional training, multimedia self-instruction courses so that customers can self-train as often as needed, site surveys to determine educational requirements, on-site classes, and clustered on-site classes to accommodate a group of users from an area. Prices vary from $126 per student per day for standard courses to $165 per student daily for the most sophisticated programs. Multimedia self-instruction courses can be purchased for prices ranging from $18 to $995.

TYPICAL CONFIGURATIONS: The following systems illustrate possible configurations for selected DPS 8 System. These configuration samples do not include software.

SMALL CONFIGURATION:

DPS 8/47 Central System; eight megabytes of main memory, integrated I/O multiplexer with 19 channel slots, one system control unit	$153,000
CSU6601 System Console; includes keyboard and 120-cps printer	10,390
CSU6602 Auxiliary Console; includes keyboard and 120-cps printer	7,728
MSP8002 Mass Storage Processor	64,375
Two MSU501 Disk Drives; 1.1GB dual spindle, fixed disk	99,300
MTP611 Magnetic Tape Processor	29,400
Two MTU0610 Magnetic Tape Units	42,000
15 VIP7814 Display Terminals	40,500
URP0600 Unit Record Processor	26,585
Two PRU1203 Impact Printers; 1200 lpm	76,550
TOTAL PURCHASE PRICE:	**$549,828**

MEDIUM CONFIGURATION:

DPS 8/52 Central System; includes eight megabytes of central storage, input/output processor, system control unit with 36 available slots	$450,000

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Honeywell DPS 8 Series

Additional CPU for total of two	340,000	megabytes of central storage, input/output processor with 36 available slots, system support console	
24 megabytes of additional main memory; 12 CMM8020 memory modules	480,000	CSU6601 System Console; includes keyboard and 120-cps printer	10,390
Additional MXC8002 system control unit	57,788	One CSU6602 Auxiliary Console; includes keyboard and 120-cps printer	7,728
One CSU6601 System Console; includes keyboard and 120-cps printer	10,390	Three additional CPUs	1,725,000
One CSU6602 Auxiliary Console; includes keyboard and 120-cps printer	7,728	56 megabytes of additional main memory; 28 memory modules	1,120,000
30 VIP7814 Display Terminals	81,000	Three additional System Control Units	173,364
Datanet 8 Network Processor	29,000	60 VIP7815 Display Units	185,700
Two DCE8007 Channel Interface Bases	5,000	One Datanet 8 Network Processor	29,000
One DCF8001 Communications Console	2,065	Eight DCE8007 Channel Interface Bases	20,000
One DCE8006 Host Connection	8,000	DCE8002 Communications Line Expansion; 16 to 64 lines	3,000
One MSP3880 Mass Storage Processor	74,270 *200*	DCF8001 Communications Console	2,065
Two MSU3380 Storage Unit/Controllers	177,600	One DCE8006 Host Connection	8,000
Six MSU3382 Mass Storage Slave Units	386,700	Two MSP3880 Mass Storage Processors	148,540
MTS8208 Magnetic Tape Subsystem; includes MTU8205	54,650	Four MSU3380 Storage Unit/Controllers	355,200
MTF8200 1 x 8 Switch	No charge	Twelve MSU3382 Mass Storage Slave Units	773,400
Seven MTU8208 Magnetic Tape Units; 200 ips 1600/6250 bpi	154,700	Two MTS8208 Magnetic Tape Subsystems; includes MTU8208	109,300
One PRU1600 Belt Printer; 1325 lpm	64,940	MTF8201 2 x 16 Switch	6,130
URP0600 Unit Record Processor	26,585	Fourteen MTU8208 Magnetic Tape Units; 200 ips, 1600/6250 bpi	309,400
TOTAL PURCHASE PRICE:	**$2,410,416**	Two PRU1600 1325-lpm Belt Printers	129,880
		URP0600 Unit Record Processor	26,585
LARGE CONFIGURATION:			
DPS 8/70 Central Complex; includes one CPU, eight	$700,000	**TOTAL PURCHASE PRICE:**	**$5,842,682**

EQUIPMENT PRICES

		Purch. Price ($)	Monthly Maint. ($)	1-Year Lease* ($)	3-Year Lease* ($)	5-Year Lease* ($)
PROCESSORS						
CPS8130	DPS 8/47 Central System; integrated I/O Multiplexer, eight megabytes of Main Memory, and System Control Unit	153,000	500	8,800	—	**7,400
CPU8129	Additional CPU for CPS8130; requires MXK8007	125,000	206	5,700	—	**5,000
CPS8132	DPS 8/49 Central System; integrated I/O Multiplexer; eight megabytes of Main Memory, and System Control Unit	235,000	662	12,075	—	**10,000
CPU8131	Additional CPU for CPS8132; requires MXK8007	135,000	308	8,000	—	**7,000
CPS8181	DPS 8/52 Central System; includes Input/Output Processor, eight megabytes of Main Memory, and System Control Unit	450,000	1,425	25,496	23,722	21,082
CPU8182	Additional CPU for CPS8181; maximum of one	340,000	830	12,003	10,849	9,934
CPS8186	DPS 8/62 Central System; includes Input/Output Processor, eight megabytes of Main Memory, and System Control Unit	550,000	2,000	29,913	27,834	25,504
CPU8185	Additional CPU for CPS8186; maximum of one	475,000	1,100	20,476	18,506	16,946
CPS8189	DPS 8/70 Central System; includes Input/Output Processor, eight megabytes of Main Memory, and System Control Unit	700,000	3,000	44,715	41,616	38,094
CPU8188	Additional CPU for CPS8189; maximum of three	575,000	1,900	31,499	28,469	26,068

*Includes equipment maintenance.
**For 4-year lease.
NC—No charge.
NA—Not available.

Honeywell DPS 8 Series

		Purch. Price ($)	Monthly Maint. ($)	1-Year Lease* ($)	3-Year Lease* ($)	5-Year Lease* ($)

PROCESSORS (Continued)

CPS8119	DPS 8/47C Central System; includes Input/Output Multiplexer, 12 megabytes of Main Memory, System Control Unit, and Datanet 8C Front-End Processor	228,000	967	11,950	—	**10,050
CPU8119	Additional CPU for CPS8119; requires MXK8007	125,000	334	5,700	—	**5,000
CPS8121	DPS 8/49C Central System; includes Input/Output Multiplexer, 16 megabytes of Main Memory, System Control Unit, and Datanet 8C Front-End Processor	350,000	1,365	17,100	—	**14,000
CPU8121	Additional CPU for CPS8121; requires MXK8007	135,000	514	8,000	—	**7,000
CPS8173	DPS 8/52C Central System; includes Input/Output Multiplexer, 16 megabytes of Main Memory, System Control Unit, and Front-End Processor	594,888	2,376	31,181	29,047	25,867
CPU8173	Additional CPU for CPS8173; maximum of one	340,000	1,018	12,191	11,037	10,122
CPS8174	DPS 8/62C Central System; includes Input/Output Multiplexer, 16 megabytes of Main Memory, System Control Unit, and Front-End Processor	695,000	2,654	35,696	33,258	29,601
CPU8174	Additional CPU for CPS8174; maximum of one	475,000	1,307	20,683	18,713	17,153
CPS8178	DPS 8/70C Central System; includes Input/Output Multiplexer, 16 megabytes of Main Memory, System Control Unit, and Front-End Processor	800,000	3,867	50,606	47,146	41,959
CPU8178	Additional CPU for CPS8178; maximum of five	575,000	2,152	31,751	28,721	26,310
CPS8199	DPS 8/70M Central System; includes Input/Output Multiplexer, eight megabytes of Main Memory, and System Control Unit	750,000	3,720	43,775	41,500	38,000
CPU8199	Additional CPU for CPS8199; maximum of five	575,000	2,152	34,251	31,000	28,310

PROCESSOR OPTIONS

MXC8001	Additional Freestanding System Control Unit (SCU) for DPS 8/70, DPS 8/70M, and DPS 8C (three max.); includes all the necessary addressing	57,788	110	1,914	1,777	1,571
MXC8003	Additional Five-Port SCU for DPS 8/47, 8/49, 47C, and 49C	27,050	54	898	834	738
MXC8002	Additional Five-Port SCU for DPS 8/52, 8/62, 8/70, 8/52C, 8/62C, 8/70C, and 8/70M; includes all necessary addressing	57,788	110	1,914	1,777	1,571
MXU6002	Freestanding Input/Output Multiplexer with 35 Channel Function Slots for DPS 8/70, DPS 8/70M, and DPS 8C; includes SCU/IOM port addressing and data rate expansion	175,055	345	4,132	4,011	3,719
MXU8003	Additional IOM for DPS 8/47, 8/49, 8/47C, and 8/49C	84,380	205	2,840	2,639	2,338
MXF6005	Input/Output Multiplexer Expansion from 35 to 54 Channel Function Slots for DPS 8/70, DPS 8/70M, and DPS 8C	53,855	117	1,297	1,272	1,233
MXU8002	Additional IOM for 8/52, 8/62, 8/70, 8/52C, 8/62C, 8/70C, and 8/70M	137,500	131	4,132	4,011	3,719
MXF8005	IOM Channel Expansion from 36 to 54 Channel Function Slots; for MXU8002-type IOM only	53,255	108	1,297	1,272	1,233
MXF8012	Multics IOM Logical Channel Expansion for DPS 8/M Systems only (24-56 channels)	10,000	20	415	385	335
MXK8009	SCU Expansion Kit (5- to 8-port); required for 3-4 processor configurations	10,791	21	356	—	**295
CPK8337	System upgrade from DPS 8/47 to 8/49	90,000	162	3,275	—	**2,600
CPK8340	Additional CPU upgrade; DPS 8/47 to 8/49	22,000	102	2,300	—	**2,000
CPK8163	System upgrade from DPS 8/52 to 8/62	135,000	575	4,644	4,536	4,423
CPK8185	Additional CPU upgrade; DPS 8/52 to 8/62	100,000	270	8,473	7,657	7,012
CPK8171	System upgrade from DPS 8/62 to 8/70	150,000	1,000	14,802	13,782	12,590
CPK8188	Additional CPU upgrade; DPS 8/62 to 8/70	100,000	800	11,023	9,963	9,122
CPK8362	System upgrade from DPS 8/47C to 8/49C	130,000	398	5,150	—	**3,950
CPK8365	Additional CPU upgrade; DPS 8/47C to 8/49C	22,000	180	2,300	—	**2,000
CPK8164	System upgrade from DPS 8/52C to 8/62C	135,000	278	4,740	4,632	4,519
CPK8174	Additional CPU upgrade; DPS 8/52C to 8/62C	100,000	289	8,492	7,676	7,031
CPK8172	System upgrade from DPS 8/62C to 8/70C	105,000	1,213	14,909	13,889	12,696
CPK8178	Additional CPU upgrade; DPS 8/62C to 8/70C	100,000	845	11,068	10,008	9,167
CPK8197	System upgrade from DPS 8/62M to 8/70M	155,000	1,107	14,525	13,250	13,000
CPK8198	Additional CPU upgrade; DPS 8/62M to 8/70M	100,000	845	13,751	13,000	11,360

Consoles & Features

CSU6601	System Console; includes keyboard and 120-cps printer	10,390	95	429	394	357
CSU6602	Auxiliary Console; includes keyboard and 120-cps printer	7,728	69	310	291	264
CSF6602	Auxiliary Keyboard/Display Attachment Feature	3,596	32	151	137	129
CSF6603	Additional Keyboard Display; 12 inches; prerequisite is CSF6602	3,082	32	169	153	117
CSF6604	Large Screen Monitor, 23 inches, and Monitor Drive Option; includes up to 50 feet of cable	2,358	16	157	141	135
CSF6605	Ceiling Mount for Large Screen Monitor	194	NC	NA	NA	NA
CSF6606	Extended System Control Feature; provides for the addition of a remote console and for switching of master auxiliary and remote consoles for backup; prerequisite is CSF6601 and CSF6602	578	5	23	21	20

Power Equipment

MGS6001	Motor Generator and Control Unit; 31.3 KVA, 60 Hz, 208/440 VAC input	17,750	68	449	435	401
MGS6002	Motor Generator and Control Unit; 62.6 KVA, 60 Hz, 440/480 VAC input	21,000	81	540	523	483
MGS6003	Motor Generator and Control Unit; 62.6 KVA, 50 Hz, 380 VAC input	22,150	84	568	533	504
MGS6004	Motor Generator and Control Unit; 62.6 KVA, 60 Hz, 208 VAC input	21,000	81	540	523	483

*Includes equipment maintenance.
**For 4-year lease.
NC—No charge.
NA—Not available.

Honeywell DPS 8 Series

		Purch. Price ($)	Monthly Maint. ($)	1-Year Lease* ($)	3-Year Lease* ($)	5-Year Lease* ($)
PROCESSORS OPTIONS (Continued)						
PSS6700	Control Unit Power, Battery Backup; DPS 8/C Systems	12,000	45	—	—	—
PSS8000	Capacitor Ridethrough Option; one required for each CPU, IOM, and SCU, in lieu of MGS or UPS	3,000	12	106	99	88
PSS8002	Battery Backup; one required for each SCU; for CPS8170/8173/8174/8178	12,000	45	425	400	383
MEMORY						
CMM8002	Additional two megabytes of memory for DPS 8/47 (CPS 8129) and 8/49 (CPS 8131)	20,000	42	1,134	1,037	939
CMM8020	Additional two megabytes of memory for DPS 8/52, 8/62, and 8/70 GCOS, CP-6, and Multics systems	40,000	120	3,243	3,005	2,684
MASS STORAGE						
MSP3880	Mass Storage Processor	74,270	200	4,400	**3,745	—
MSP3884	Mass Storage Processor	88,270	224	5,230	**4,450	—
MSP0611	Mass Storage Processor; freestanding; single channel	50,000	123	1,819	1,690	1,498
MSP0612	Mass Storage Processor; freestanding; dual channel	64,375	168	2,120	1,971	1,748
MSK0612	Upgrade Kit from MSP0611 to MSP0612	23,000	60	856	797	706
MSU0400	Removable Disk Mass Storage Unit; 100M bytes, requires MSF0004	16,500	132	863	810	731
MSU0451	Removable Disk Mass Storage Unit; 200M bytes, requires MSF007	27,047	122	1,140	1,064	950
MSF0006	Dual Access Feature for MSU0451	2,070	14	89	83	76
MSF0007	Remote Position Sensing Option for MSU0451; one required for each disk unit	2,025	14	87	82	76
MSF1141	Device Adapter for attachment of up to 16 MSU0451 for MSP0612 only; cannot be used with MSF1142	6,000	—	187	173	152
MSU3380	Head of String Mass Storage Unit; includes four actuators	88,800	295	4,780	**4,070	—
MSU3382	Mass Storage Slave Unit; includes four actuators	64,450	215	3,470	**2,960	—
MSU0500	Dual Fixed Disk Mass Storage Unit; 940 million characters, 626M bytes; includes disk and rotational position sensing	38,850	172	1,386	1,293	1,154
MSU0501	Dual Spindle Fixed Disk Drive; 1101M bytes; includes disk and rotational position sensing	49,650	197	1,747	1,629	1,452
MSK0501	Upgrade Kit; MSU0500 to MSU0501	10,800	25	361	336	297
MSF0011	Dual Access Feature for MSU0500	4,140	23	163	152	136
MSA1140	Unit Addressing for MSU04xx Units (4 max.); for MSP0611 only	3,500	16	156	145	130
MSA1141	Unit Addressing for MSU05xx Units (2 max.); for MSP0611 only	3,500	16	219	204	180
MSA1142	Unit Addressing for MSU04xx Units; one per four MSUs	4,500	18	146	136	122
MSA1143	Unit Addressing for MSU05xx Devices; one per two MSUs	4,500	18	215	200	177
MSF0500	Spare Head Disk Assembly	12,340	—	—	—	—
MSF0501	Spare Head Disk Assembly	15,808	—	—	—	—
MSF1140	Device Adapter for MSU04xx Devices on MSP0611 only	3,500	—	109	101	89
MSF1141	Device Adapter for MSU04xx Devices (one maximum); required for configuring MSU0451	6,000	—	187	173	152
MSF1142	Unit expansion for up to 7 additional MSU05xx for MSF0612; cannot be used with MSF1141	4,000	—	125	115	105
MSF1143	First Switched DATANET Channel for MSP0611/0612	8,237	15	283	262	233
MSF1144	Switched IOM Channel for MSP0611/0612	8,237	15	283	262	233
MSF1150	Second Switched DATANET Channel for MSP0611/0612	8,237	15	283	262	233
MSK1141	Upgrade kit for MSF1140 to MSF1141 for MSU04xx Device Adapter; Single to Dual Channel	3,500	2	78	72	63
MSK1142	Upgrade Kit for MSA1140 to MSA1142 for MSU04xx Addressing; Single to Dual Channel	1,700	2	40	35	30
MSK1143	Upgrade Kit for MSA1141 to MSA1143 for MSU05xx Addressing; Single to Dual Channel	1,700	2	40	35	30
MSP8000	Integrated Single Channel Mass Store Processor for DPS 8/47, 8/49	46,800	108	1,749	1,624	1,439
MSP8002	Integrated Dual Channel Mass Store Processor for DPS 8/47, 8/49	64,375	168	2,120	1,971	1,748
MSF8000	Device Adapter for MSU04xx Devices on MSP8000 only	3,500	—	159	146	132
MSF8101	Device Adapter for Attachment of up to 16 MSU04xx Devices for MSP8002 only	6,000	—	187	173	152
MSA8102	Addressing for four MSU04xx devices for MSP8002	4,500	18	146	136	122
MSA8103	Addressing Capability for two MSU0500/0501 for MSP8002 only	4,500	18	214	199	177
MSA8001	Addressing Capability for two MSU0500/0501 for MSP8000 only	3,500	16	234	218	193
MSK8002	Upgrade Kit for MSP8000 to MSP8002	23,000	60	793	738	654
MSF8002	Nonsimultaneous (Switched) DATANET Channel for MSP800x Devices	8,158	15	280	260	231
MSF8003	Nonsimultaneous (Switched) IOM Channel for MSP800x Devices	8,158	15	280	260	231
MSK8102	Upgrade Kit for MSF8000 to MSF8101/8001 for MSU4xx Device Adapter; Single to Dual Channel	3,500	2	78	72	63
MSK8104	Upgrade Kit for MSA8000 to MSA8102/8002 for MSU4xx Device Addressing	1,700	2	40	35	30
MAGNETIC TAPE EQUIPMENT						
MTS8205	Magnetic Tape Subsystem; includes tape processor, one MTU8205 tape unit, and one IOP channel	55,350	526	2,913	**2,516	—
MTS8206	Magnetic Tape Subsystem; includes tape processor, one MTU8206 tape unit, and one IOP channel	52,700	549	2,774	**2,395	—

*Includes equipment maintenance.
**For 4-year lease.
NC—No charge.
NA—Not available.

MAY 1986

Honeywell DPS 8 Series

		Purch. Price ($)	Monthly Maint. ($)	1-Year Lease* ($)	3-Year Lease* ($)	5-Year Lease* ($)
MAGNETIC TAPE EQUIPMENT (Continued)						
MTS8208	Magnetic Tape Subsystem; includes tape processor, one MTU8208 tape unit, and one IOP channel	54,650	613	2,876	**2,484	—
MTF8200	Magnetic Tape Subsystem 1 x 8 Switch; either this feature or MTF8201 required for each MTS82xx	NC	NC	NC	NC	—
MTF8201	Magnetic Tape Subsystem 2 x 16 Switch	6,130	14	323	**279	—
MTF8202	Magnetic Tape Subsystem Switched Channel; includes IOP or CBU channel	8,000	12	421	**364	—
MTP0610	Magnetic Tape Processor; 1 x 8; requires MTF1149 and/or MTF1150	29,400	168	1,166	1,091	977
MTP0611	Magnetic Tape Processor; 1 x 8; requires MTF1159 and/or MTF1160	29,400	178	1,080	995	905
MFP8001	Integrated Multifunction Processor for Magnetic Tape/Unit Record; Device supports eight tape/four unit record devices; requires MTF1159 and MTF1160	36,086	169	1,338	1,250	1,117
MTP8001	Integrated Magnetic Tape Processor, single channel (8 maximum); requires MTF1159 and/or MTF1160	28,060	166	1,061	991	888
Magnetic Tape Units:						
MTU0610	Magnetic Tape Unit, includes cartridge load; one speed/density feature is required for each MTU0610	21,000	146	801	751	677
MTU0630	Magnetic Tape Unit	14,815	130	593	557	505
MTU8205	Magnetic Tape Unit; 125 ips, 800/1600 bpi	19,725	338	1,038	**897	—
MTU8206	Magnetic Tape Unit; 125 ips, 1600/6250 bpi	20,150	363	1,061	**916	—
MTU8208	Magnetic Tape Unit; 200 ips, 1600/6250 bpi	22,100	427	1,163	**1,005	—
Features for the MTU0630:						
MTF0634	75 ips, PE/NRZI feature	4,725	140	286	274	257
MTF0635	75 ips, PE/GCR feature	7,110	120	342	325	300
MTF0636	125 ips, PE/NRZI feature	9,805	158	460	435	398
MTF0637	125 ips, PE/GCR feature	10,330	137	460	435	398
MTK0630	Performance upgrade; MTF0634 to MTF0635	2,385	20	75	70	60
MTK0631	Performance upgrade; MTF0636 to MTF0637	1,700	25	55	50	45
MTK0632	Performance upgrade; MTF0634 to MTF0636	5,080	20	175	165	145
MTK0633	Performance upgrade; MTF0635 to MTF0637	3,220	17	120	110	100
MTK0634	High Altitude Adapter	240	—	8	8	6
MTA1152	Magnetic Tape Addressing for MTU0400/0410/0411/0412/0500/0600/0610/0630; addresses up to four devices	800	—	25	23	20
MTF1125	Series 200/2000 to Level 66 tape compatibility feature (one required for each MTP0611/MTF1151)	2,410	7	81	75	66
MTF1152	Switched Channel; includes IOM channel (one required for each MTP0611/MTF1151, MFP8001, MTP8001)	6,174	8	199	185	163
MTF1151	Dual Simultaneous Channel; adds 2nd channel to MTP0611; allows up to 16 Magnetic Tape Units; includes IOM channel and requires redundant options	36,028	116	1,230	1,144	1,016
MTF1155	ASCII Code Translator (one required for each MTP0611/MTF1151/MTP8001/MFP8001)	945	—	30	27	24
MTF1156	EBCDIC Code Translator (one required for each MTP0611/MTF1151/MTP8001/MFP8001)	945	—	30	27	24
PSS8001	Capacitor Ridethrough Option for MSP0611/0612/8002 and MTP0611	3,120	13	123	116	103
MTF1157	EBCDIC/ASCII Code Translator (one required for each MTP0611/MTF1151/MTP8001/MFP8001)	945	—	30	27	24
MTF1158	7-Track (556/800 bpi) Capability (one required for each MTP0611/MTF1151/MTP8001/MFP8001); prerequisite is MTF1159	1,827	4	60	56	49
MTF1159	9-Track NRZI/PE (800/1600 bpi) Capability (one MTF1159 and/or MTF1160); required for each MTP0611/MTF1151/MTP8001/MFP8001	536	17	31	30	28
MTF1160	9-Track PE/GCR (1600/6250 bpi) Capability (one MTF1159 and/or MTF1160); required for each MTP0611/MTF1151/MTP8001/MFP8001	6,166	68	254	239	217
UNIT RECORD PROCESSORS & FEATURES						
URP0600	Freestanding Unit Record Processor; accommodates four devices	26,585	42	940	895	791
URP8000	Integrated Unit Record Processor; accommodates eight devices and cannot be used with MTP8000/8001 or MFP8000/8001	26,250	30	916	849	769
URP8001	Embedded Unit Record Processor for up to two Printers and two Card Units	6,500	6	209	194	188
URP8002	Embedded Unit Record Processor for up to two card units	4,000	3	128	118	104
URP8004	Embedded Unit Record Processor for up to two printers	4,000	3	128	118	104
URP8012	Embedded Unit Record Processor for up to two Card Units. For CP-6 Systems only.	4,000	3	128	118	104
URF0040	Unit Record Addressing Expansion for URP0600/0601/0602/8000; required if more than four devices used or if drum and belt printers are mixed. Feature accommodates three additional devices.	983	2	35	32	28
Punch Card/Printer Equipment:						
URA0050	Addressing capability for PCU0120; one required for each device	4,253	4	151	139	123
URA0055	Addressing capability for PRU1600; one required for each device	7,167	19	264	242	220
URA0056	Addressing capability for CRU0501; one required for each device	265	—	9	8	6

*Includes equipment maintenance.
**For 4-year lease.
NC—No charge.
NA—Not available.

Honeywell DPS 8 Series

		Purch. Price ($)	Monthly Maint. ($)	1-Year Lease* ($)	3-Year Lease* ($)	5-Year Lease* ($)
LINE PRINTERS						
PRU0903	High-speed printer; 900 lpm	34,975	421	2,065	1,830	1,720
PRU1203	High-speed printer; 1200 lpm	38,275	468	2,340	2,055	1,920
PRU1600	High-speed Belt Printer; 1325 lpm	64,940	538	2,910	2,735	2,472
PRU0903/1203 Options:						
PRB3213	Uppercase ASCII, optimized	—	—	—	—	—
PRB3300	Upper/Lowercase ASCII, optimized	—	—	—	—	—
PRB3500	Series 400/600/6000/L66	—	—	—	—	—
PRB3501	Standard IBM	—	—	—	—	—
PRB3513	Uppercase ASCII	—	—	—	—	—
PRB3524	OCR-A Numeric	—	—	—	—	—
PRB3549	OCR-A Alphanumeric	—	—	—	—	—
PRB3600	Upper/Lowercase ASCII	—	—	—	—	—
PRB3703	Series 200/2000	—	—	—	—	—
PRK0903	Upgrade PRU903 to PRU1203	5,000	50	300	250	225
PRK0907	Exchange of PDSI to DAI interface for 0903 and 1203; includes control panel	3,000	—	—	—	—
PRU1600 Options:						
PRB0500	OCR-B Print Belt	2,460	90	179	173	164
PRB0524	OCR A/B Print Belt	2,460	90	179	173	164
PRB0532	Puerto Rico Print Belt	2,460	94	179	173	164
PRB0549	OCR-A Alphanumeric Print Belt	2,460	90	179	173	164
PRB0600	ASCII Belt; upper-/lowercase	2,567	90	184	177	166
PRF0022	24 Additional Print Positions; 136 to 160	2,610	16	112	105	93
PUNCHED CARD EQUIPMENT						
CRU0501	Card Reader (500 cpm); requires URA0056	19,500	119	684	638	568
PCU0121	Card Punch (100-400 cpm); requires URA0050	20,032	153	900	777	698
URA0050	Addressing capability for PCU0121 and PCU0401	4,253	4	151	139	123
TERMINALS						
VIP7201	Asynchronous, Multipurpose Keyboard Display Terminal	795	20	—	—	—
VIP7301	Standard Keyboard Display Terminal with RS-422-A interface and 25-foot cable; includes optional RS-232-C interface	1,900	20	—	—	—
VIP7303	Word Processing Keyboard Display Terminal with RS-422-A interface and 25-foot cable; includes optional RS-232-C interface	1,900	20	—	—	—
VIP7307	Data Entry Keyboard Display Terminal with RS-422-A interface and 25-foot cable; includes optional RS-232-C interface	1,900	20	—	—	—
VIP7305	Multifunction Keyboard Display Terminal with RS-232-C/RS-422-A interface and 25-foot cable	1,900	20	—	—	—
VIP7814	Synchronous/Asynchronous Keyboard Display Terminal with 12-inch diagonal CRT, 1,920-character display positions	2,700	25	—	123	—
VIP7815	Synchronous/Asynchronous Keyboard Display Terminal with 15-inch CRT green phosphor, RS-232-C, and RS-422-A interfaces	3,095	30	—	138	—
VIP7823	Asynchronous Keyboard Display Terminal with Multifunction Keyboard; includes a 72-line scroll feature, buffered print adapter, and 25-foot, RS-422-A cable	2,350	25	—	—	—
DATANET 6661 FRONT-END NETWORK PROCESSORS						
DCU6661	Processor; includes 64K bytes of memory, system support controller, direct interface adapter; up to 12 channel interface bases	36,605	261	1,990	1,862	1,669
DCF6607	Channel Interface Base	1,651	9	70	65	58
DCF6611	Dual Synchronous Channel Package, EIA RS-232-C	1,450	7	60	56	50
DCF6612	Dual Asynchronous Channel Package, EIA RS-232-C	590	4	26	25	23
DCF6613	Automatic Call Unit, Dual Channel	1,180	4	46	44	39
DCF6614	MIL-STD-188C Synchronous Channel	1,501	8	63	59	53
DCF6618	Dual Binary Synchronous Channel Package	1,450	7	60	56	50
DCF6619	Broadband Channel	3,056	12	125	117	104
DCF6620	HDLC Voice Grade Channel	2,573	11	106	99	89
DCF6621	Bisynchronous Broadband Channel	3,056	12	125	117	104
DCF6626	Direct Connect Capability	350	2	15	14	13
DCF6625	Direct Connect Capability, synchronous	480	1	17	16	15
DCF6627	Broadband Channel, CCITT V.35	3,430	12	139	129	114
DCF6927	Universal Modem Bypass, synchronous to 19.2K bps or asynchronous to 1800 bps	415	11	30	30	24

*Includes equipment maintenance.
**For 4-year lease.
NC—No charge.
NA—Not available.

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Honeywell DPS 8 Series

		Purch. Price ($)	Monthly Maint. ($)	1-Year Lease* ($)	3-Year Lease* ($)	5-Year Lease* ($)
DATANET 6661 (Continued)						
DCF6610	20 ma Current Loop-Dual Channel Package	1,180	4	46	44	39
DCF6615	MIL-STD-188C Asynchronous Dual Channel	1,501	8	63	59	53
DCF6616	MIL-STD-188C Broadband Channel	1,501	8	63	59	53
DCF6617	MIL-STD-188C HDLC Channel	2,573	11	106	99	89
DCF6622	HDLC Broadband Channel	3,056	12	125	117	104
DCF6623	HDLC Channel, CCITT V.35	3,430	12	139	129	114
DATANET 8 FRONT-END NETWORK PROCESSOR						
DCU8010	Processor; includes 512K bytes of memory, system support controller, 512K bytes diskette drive, up to 16 channel interface bases	29,000	135	1,123	1,049	937
DCE8002	Communications Line Expansion from 16 to 64 lines	3,000	5	106	98	86
DCE8003	Processor Power Module Enhancement; requires DCE8002	7,400	40	293	274	245
DCE8004	Communications Line Expansion from 64 to 128 lines; requires DEC8002/8003	5,000	10	179	166	147
DCE8005	Additional 512K diskette unit; maximum of one additional can be configured	1,785	18	79	75	68
DCE8006	DPS 8 Host Connection (four max.); third and fourth host connection requires DCE8002, if not already installed	8,000	65	339	319	288
DCF8001	Communications Console	2,065	40	105	100	92
DCF8007	Channel Interface Base; maximum of 16	2,500	14	99	93	83
DCF8011	Dual Synchronous Channel; EIA RS-232-C; to 9600 bps	1,500	8	58	55	49
DCF8012	Dual Asynchronous Channel; EIA RS-232-C; to 9600 bps	1,000	5	39	36	32
DCF8020	HDLC; EIA RS-232-C Channel	1,500	8	58	55	49
DCF8022	Single Synchronous HDLC Wideband Channel; to 56K bps	3,000	16	118	110	98
DCF8023	Single Synchronous HDLC Wideband Channel; CCITT V.35; to 56K bps	3,000	16	118	110	98
DCF8024	Direct Connect Capability, asynchronous or synchronous; to 9600 bps. For use with RS-232-C channels only.	350	2	14	13	12
DCF8026	Universal Modem Bypass, synchronous to 19.2K bps or asynchronous to 1800 bps	415	2	16	15	13
DATANET 8/C FRONT-END NETWORK PROCESSOR (FOR DPS 8/C SYSTEMS)						
DCU8011	Data Communications Subsystem; up to 16 channel interface bases	29,000	135	1,124	1,050	939
DCF8030	Channel Interface Base and eight Asynchronous RS-232-C Ports	6,000	37	242	227	204
DCF8032	Channel Interface Base and eight Synchronous RS-232-C Ports	7,700	49	313	294	264
DCF8034	Channel Interface Base and eight Current Loop Ports	6,000	37	242	227	204
DCF8036	Two Asynchronous Current Loop Ports; Direct Connect to 9600 bps (no CIB)	1,000	6	41	38	35
DCF8038	Channel Interface Base and one Broadband Synchronous Port, 301/303 compatible, with Modem Cable	4,500	23	177	165	148
DCF8040	Channel Interface Base and one Broadband HDLC Port, V.35 CCITT compatible, with Modem Cable	5,500	28	216	201	180
DCF8042	Channel Interface Base and one Broadband Synchronous Port, V.35 CCITT compatible with Modem Cable	4,500	23	177	165	148
DCF8044	Channel Interface Base and Broadband HDLC Port, 301/303 compatible, with Modem Cable	5,500	28	216	201	180

*Includes equipment maintenance.
**For 4-year lease.
NC—No charge.
NA—Not available.

SOFTWARE PRICES

		Monthly License Fee ($)	Optional Support Charge ($)
GCOS 8 SYSTEM			
SVS8000	GCOS 8 Operating System EXEC	*NSC	—
SVP8000	System Maintenance Facility	87	44
SVP8001	Software Management Facility	79	13
SVP8002	System Performance Analysis Facility	281	25
SVE8000	FMS Catalog Cache Facility	69	13
SVE8001	FMS Test Access Mode Facility	70	8
SVE8002	Password Encryption Facility	58	5
SVJ8000	Parametric JCL	36	5

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****Class III—unsupported.

Honeywell DPS 8 Series

		Monthly License Fee ($)	Optional Support Charge ($)
Utilities:			
SNU0471	PPS Utilities	25	—
SNU0472	PPS Off-line	*NSC	—
SNU0473	PPS On-line	*NSC	—
SVU8012	File Management System Utilities	316	45
SVU8000	Systems Utilities Facility	52	5
SVU8001	File Generation Facility	49	5
SVU8002	Sort/Merge Facility	107	17
Data Management:			
SVD8000	DM-IV Standard Facility	1,041	183
SVD8001	DM-IV Fortran Subschema Translator Option	120	10
SVD8002	I-D-S/I Facility	1,041	110
SVD8003	Indexed Sequential Processing Facility	28	6
SVD8006	Data Dictionary/Batch	281	35
SVD8007	Data Dictionary/On-line	125	15
Languages and Compilers:			
SVL8000	Cobol-74 Compiler & Runtime Facility	262	26
SVL8001	Fortran Compiler & Runtime Facility	354	50
SVL8002	PL/1 Compiler & Runtime Facility	285	50
SVR8002	PL/1 Runtime Facility	77	11
SVL8003	RPG-II Facility	133	5
SVL8010	Fortran-77 Compiler & Runtime Facility	213	15
SVL8011	Fortran-77 Hex Option	NC	NC
SVL8012	Fortran-66 Compatibility Option for Fortran-77	NC	NC
SVL8013	Cobol-74 Relational Query (RQ)	90	10
SVR8000	Cobol-74 Runtime Facility	86	9
SVR8004	Fortran-77 Runtime Facility	63	5
SVP8008	Debug Support Option	104	20
SVP8009	Cobol-74 Debug Support Option	190	27
SVP8010	Fortran-77 Debug Support Option	229	10
SVL8008	Cobol-68 Compiler & Runtime	306	39
Transaction Processing:			
SVS8006	TDS Facility	1,601	210
SVS8007	TPE Facility	561	55
SVS8002	DM-IV TP Facility	1,389	167
SVU8003	DM-IV TP Forms Option	250	50
Time-Sharing:			
SVE8020	Multicopy Time-sharing Option	557	110
SVS8005	TSS Facility	84	22
SVE8019	TSS Administration Option	118	16
SVE8008	TSS File Management Option	112	11
SVE8009	TSS Advanced Application Support Option	167	33
SVE8010	TSS Media Input Option	55	11
SVL8007	TSS Basic Language Option	202	38
SVE8011	TSS Cobol-74 Option	55	11
SVE8012	TSS Fortran Option	55	11
SVE8013	TSS Text Processing Option (TEX)	320	66
SVE8014	TSS Editing Option (EDIT)	101	22
SVE8015	TSS Document Formatting Option	51	11
SVE8016	TSS Electronic Mail Option	167	33
SVE8017	TSS Sort Interface Option	70	11
SVE8022	TSS Fortran-77 option	55	11
SVD8004	TSS Data Basic	139	22
SVE8018	TSS DM-IV Option	82	14
Communications Software:			
SVC8000	GRTS-II Facility	273	44
SVC8001	GRTS-II HDLC Support Option	129	11
SVC8002	NPS Facility	974	209
SVC8003	NPS HDLC Support Option	129	11
SVC8006	Host File Transceiver Facility for L6	16	6

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Honeywell DPS 8 Series

		Monthly License Fee ($)	Optional Support Charge ($)
Communications Software (Continued)			
SVC8004	Extended FNP Support Facility	139	28
SVC8048	GRTS-I Facility	450	110
Query and End-User Facilities:			
SVD8005	I-D-S/I Data Query Option	167	33
SVP8003	DM-IV QRP Option	375	59
SVH8000	Personal Computing Facility	170	30
SVP8004	DM-IV PLP Option	263	45
SVH8001	PDQ Example Query (EQ)	350	40
SVH8002	PDQ Interactive Query (IQ)	270	30
SVH8003	PDQ Comprehensive Report Examination & Display Option (CREDO)	210	25
SVP8006	MDQS/II Facility	612	117
SVP8007	MDQS/IV Facility	1,058	212
Other:			
SVS8003	DM-IV TP Comprehensive Facility	2,755	286
SVR8003	TSS Text Processing (TEX) Library Option	36	5
SVD8024	DDE Basic System	1,373	226
SVD8028	DDE Comprehensive Package for TDS	3,575	506
SVD8031	DDE Comprehensive Package for TPE	3,360	474
SVD8033	DDE System Management Facility for TDS	1,484	244
SVD8034	DDE System Management Facility for TPE	1,385	228

CP-6 SYSTEMS

SFS6120	Control Program-6 (CP-6) Basic System	—	—
SFS6121	Time-Sharing Remote Batch and Multi-Stream Batch Access Modes	1,150	—
SFS6122	Transaction Processing Mode	546	—
SFC6120	Local Front-End Communication Software	104	—
SFC6121	Remote Communications; required with DCS6700	100	—
SFD6120	Interactive Database Processor (IDP)	414	—
SFD6121	I-D-S/II Integrated Data Store/II	978	—
SFL6120	ANS Fortran	345	—
SFL6121	APL	374	—
SFL6122	Basic	345	—
SFL6123	RPG-II	115	—
SFL6124	Cobol	244	—
SFP6120	Assembler	58	—
SFP6121	Text	334	—
SFU6120	Sort Merge	115	—
SFU6121	Forms Processor	173	—
SFX6001	Math Library	—	—
SFU6011	System Aids	—	—
SFL6125	PL/6	224	—

MULTICS SYSTEM

SGS6800	Multics Operating System	*NSC	—
SGS6801	GCOS (III) Time-Sharing Environment	1,089	—
SGS6802	Transaction Processing Tools	545	—
SGS6803	FAST/DFAST (Fast Access System for Time-Sharing)	534	—
SGS6804	GCOS (III) Batch Environment Facility	*NSC	—
SGE6800	Multics System Software Extensions	**1,630	—
SGE6802	Remote Job Entry Facility	103	—
SGD6805	Menu Facility	55	—
SGC6800	Multics Communications System (Multics CS)	275	—
SGC6801	Autocall Support Option to Multics CS	121	—
SGC6802	3270 Support Option to Multics CS	242	—
SGC6803	Basic Bisync. Support Option—Multics CS	121	—
SGC6804	G115 Support Option to Multics CS	121	—
SGC6805	File Transfer Facility	47	—
SGC6807	Multics HASP Facility (requires Basic Bisync. Support Option SGC6803)	77	—
SGC6822	X.25 Network Interface Facility	***165	—
SGC6823	Inter Multics File Transfer Facility	***47	—
SGL6801	Fortran Compiler and Runtime Facility	200	—
SGL6802	Basic Compiler and Runtime Facility	407	—
SGL6803	Cobol-74 Compiler and Runtime Facility	240	—

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Honeywell DPS 8 Series

		Monthly License Fee ($)	Optional Support Charge ($)
MULTICS SYSTEM (Continued)			
SGL6805	MRPG (Report Generator) Facility	104	—
SGL6806	APL (Version 2)	440	—
SGU6800	Wordpro Comprehensive Facility	935	—
SGU6803	Lister Facility	182	—
SGU6804	Speedtype Facility	121	—
SGU6805	Dictionary Tools	193	—
SGU6820	Compose Facility	523	—
SGD6807	Format Document Facility	44	—
SGU6821	Mergenthaler VIP Device Support Option to Compose	121	—
SGU6833	TED (Text Editor) Facility	319	—
SGU6834	EMACS Text Processing Facility	515	—
SGU6807	Extended Mail Facility	321	—
SGD6806	Executive Mail System (requires Menu Facility SGD6805)	165	—
SGC6824	Forum (Teleconferencing) Facility	***165	—
SGU6801	Sort/Merge Facility	170	—
SGU6835	Offline Page Printing System Support Facility	72	—
SGD6800	MRDS (Multics Relational Data Storage) Facility	660	—
SGD6801	LINUS (Logical Inquiry and Update System) (requires MRDS SGC6800)	560	—
AGS6801	Time Sharing Library	****150	—
AGS6802	ISTAT	****68	—
AGS6803	Graphics Facility	253	—

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