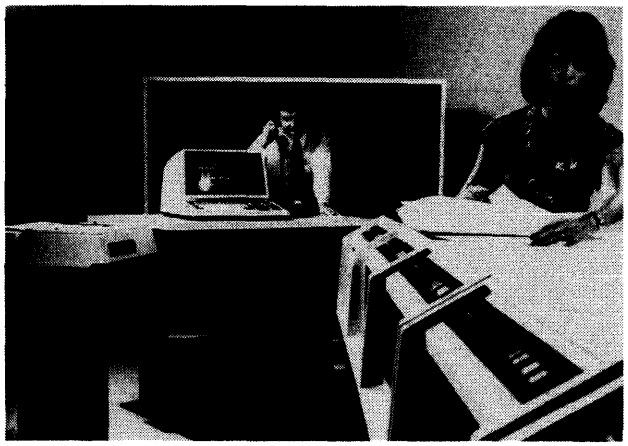
Honeywell DPS 8 Series

MANAGEMENT SUMMARY

Honeywell has undertaken to expand the power performance of their DPS 8 Series with the first quarter 1983 introduction of two new models—DPS 8/47 and 8/49. With these new systems, Honeywell is now able to offer their users a wide performance range for smooth, uninterrupted growth. In total, 18 variations of eight model types are provided. The new 8/47 and 8/49 employ the same architecture as the DPS 8/20 and 8/44 Systems but utilize faster circuitry for greater performance. An advanced, high-speed version of transistor-to-transistor logic (TTL) called Fairchild FAST is used in the computer design. The DPS 8/47 offers approximately 18% more processing power than the DPS 8/44, while the DPS 8/49 is said to be approximately 72% more powerful than the DPS 8/44.

Price/performance improvements noted for other systems in the DPS 8 line include improvements over existing Honeywell systems of from 5 percent under a Level 66/DPS 440 to 28 percent under a dual-processor Level 66/DPS/C3. The low end DPS 8/20 has about twice the performance of an IBM 4331-1 and about 75 percent more power than a Honeywell Level 66 Model 66/05. The DPS 8/44 has about the same performance as the IBM 4341-1. Announcement 1st quarter 1983 was an added power enhancement for the DPS 8/44 model and the Datanet 8 front-end network processor. The DPS 8/50 has about 25 percent less power than the DPS 8/52, and twice the power of the DPS 8/20. The DPS 8/52 has about the same performance as the IBM 3031 and about one-third more power than the Level 66/DPS-520. The DPS 8/62, introduced October, 1980, has about 35 percent more than the DPS 8/52. The DPS 8/70 (single processor) has slightly less performance than the IBM 3032 and about twice that of the Level 66 Model 66/80. The DPS 8/70 with four processors is comparable to IBM's 3033MP.



Honeywell expands the DPS 8 Series with two new entry-level models—the DPS 8/47 and 8/49 on GCOS 8 and CP-6 operating systems, and the DPS 8/52M and 8/62M on Multics. These latest additions to the DPS 8 family are designed with the same architecture as previous DPS 8 systems, but utilize faster circuitry for improved price/performance.

The DPS 8 Series is Honeywell's family of 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. A variety of peripheral devices are offered with these systems which are capable of supporting batch processing, remote job entry, interactive remote job entry, timesharing, and transaction processing functions.

MODELS: DPS 8/20, 8/20C, 8/44, 8/44C, 8/44CD, 8/47, 8/47C, 8/49, 8/49C, 8/52, 8/52C, 8/52M, 8/62, 8/62C, 8/62M, 8/70, 8/70C, 8/70M.

CONFIGURATION: The DPS 8 systems can have from 2 to 64 megabytes of memory, 1 to 6 CPUs, and up to 54 channel slots per I/O multiplexer.

COMPETITION: Amdahl 470; Burroughs B2900-6900; IBM 4300, 303X; NAS AS/3000, AS/5000, AS/7000, AS/9000; NCR V-8500, V-8600; Univac 1100 Series.

PRICE: Purchase prices for a DPS 8 system extend from $149,350 for an entry level DPS 8/20 consisting of the CPU, System control unit, I/O multiplexer, and two megabytes memory which make up the basic system housed in one central system cabinet to $900,000 for the top of the line DPS 8/70M Central System; freestanding; with two megabytes memory.

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 8/20, 8/20C, 8/44, 8/44C, 8/44CD, 8/47, 8/47C, 8/49, 8/49C, 8/50, 8/50C, 8/52, 8/52C, 8/52M, 8/62, 8/62C, 8/62M, 8/70, 8/70C, 8/70M.

DATE ANNOUNCED: DPS 8/20, 8/44, 8/52, 8/70, October 1979; DPS 8/70M, April 1980; DPS 8/70C, June 1980; DPS 8/62, October 1980; DPS 8/20C, 8/44C, 8/44CD, 8/52C, 8/62C, March 1981; DPS 8/50, 8/50C, March 1982; 8/47, 8/47C, 8/52M, 8/62M, 8/49, 8/49C, 1st quarter 1983.

DATE OF FIRST DELIVERY: DPS 8/20 through 8/70, 2nd quarter 1980; DPS 8/44D, 1st quarter 1981; DPS

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The DPS 8 Series processors are general purpose systems oriented toward a distributed processing environment and efficient communications network management. For over a decade now, Honeywell, as a company, has pioneered the separation-of-function concept, implementing both centralized and distributed networks. Each system in the DPS 8 line is capable of concurrently supporting batch processing, remote job entry, interactive remote job entry, time-sharing, and transaction processing activities.

Honeywell has further enhanced the DPS 8 line by offering comprehensive applications software to optimize management of systems resources, and by offering database management software for end user applications. The Honeywell DPS 8 Series utilizes four different operating systems—GCOS, GCOS 8, CP-6, and Multics—depending on the system.

The DPS 8 Series was first introduced 4th quarter 1979, the same year IBM announced their 4300 Series. Competitive systems from Amdahl, Burroughs, NAS, NCR and Univac appeared on the scene later. All DPS 8 systems use microprocessors and feature Large Scale Integration (LSI) circuit elements with improved logic packing density boards.

Honeywell designed the DPS 8 series around its Distributed Systems Environment (DSE) concept, in which computer power is either centralized or distributed to remote locations as needed by the individual organization. The layered data communication architecture which governs the implementation of such systems is the Distributed Systems Architecture (DSA). The smaller DPS 8/20, 8/44, 8/47 and 8/49 systems are targeted either as host processors or, more particularly, as remote satellite processors in a larger network. The larger systems are projected as host processors. Additional remote processors, such as Honeywell's DPS 6 minicomputer, round out the framework of the DSE.

PROCESSORS AND PERIPHERALS

All DPS 8/49 and below models use microprocessors with 16K/64K chips to perform program execution, computation, and other system control functions independently. The new systems use LSI circuitry to support the microprocessors in such areas as cache memory, directory, and control store functions. The low end systems, the DPS 8/20 and 8/44, use bit slice microprocessor technology. The new 8/47 and 8/49 employ the same architecture as the DPS 8/20 and 8/44 systems but utilize faster circuitry for greater performance while employing the same compact cabinetry. The larger systems, the DPS 8/50, 8/52, 8/62, and 8/70, use MSI Schottky TTL logic extensively in system design. All DPS 8 systems use a newly designed high density universal (HDU) board, which reduces the maximum number of boards required. The DPS 8/20 can be field upgraded to the DPS 8/44, and both can be field upgraded to four-processor systems. The DPS 8/50 can be field upgraded to the DPS 8/52, which can be field upgraded to the DPS 8/62, and ultimately, to the DPS 8/70. Each basic DPS 8 system is equipped with a central processor, one System Control Unit (SCU), one Input/Output Multiplexer (IOM), and two megabytes of

8/70M, 1st quarter 1982; DPS 8/62 and 8/70C, 3rd quarter 1981; DPS 8/20C through 8/62C, 1st quarter 1982; DPS 8/50, 8/50C, 2nd quarter 1982; DPS 8/47, 8/47C, 8/52M, 8/62M, 8/49, 8/49C, 1st quarter 1983. (Support of three and four processor DPS 8/49 configurations is scheduled for fourth quarter 1983.

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 four-bit groups; six-bit, nine-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 four-bit or nine-bit character format. They are expressed as unsigned numbers or as signed numbers using a separate sign character.

Alphanumeric data is represented by nine-bit, six-bit, or four-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 word 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-, 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 STORAGE

STORAGE TYPE: Metallic oxide semiconductor (MOS).

CAPACITY: See Table 1.

CYCLE TIME: See Table 1.

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.

STORAGE PROTECTION: The DPS 8 systems use a 4-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

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TABLE 1. CHARACTERISTICS OF DPS 8 SYSTEMS

	DPS 8/20	DPS 8/44	DPS 8/47	DPS 8/49	DPS 8/50	DPS 8/52	DPS 8/62	DPS 8/70
SYSTEM CONFIGURATION								
No. of central processors	1 to 2	1 to 2	1 to 2	1 to 2	1 to 2	1 to 2	1 to 2	1 to 4
No. of system controllers	1 to 2	1 to 2	1 to 2	1 to 2	1 to 2*	1 to 2*	1 to 2*	1 to 4
No. of I/O multiplexers	1 to 2	1 to 2	1 to 2	1 to 2	1 to 2*	1 to 2*	1 to 2*	1 to 4
No. of board slots	19	19	19	19	36; 37 to 54 opt.	36; 37 to 54 opt.	36; 37 to 54 opt.	36; 37 to 54 opt.
No. of network processors**	1 to 4	1 to 4	1 to 4	1 to 4	1 to 4	1 to 4	1 to 4	1 to 8
Max. no. of lines	512	512	512	512	512	512	512	1,024
DATANET 8	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
DATANET 6661***	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control unit, ICU or FS	ICU	ICU	ICU	ICU	ICU	FS	FS	FS
CENTRAL PROCESSOR								
Relative speed	1.0	1.5	1.5	1.5	2.0	2.5	3.4	5.7
No. of instructions	289 + 91 EIS	289 + 91 EIS	289 + 91 EIS	289 + 91 EIS	289 + 91 EIS	289 + 91 EIS	289 + 91 EIS	289 + 91 EIS
EIS instruction set	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cache memory	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Size, bytes	8K	8K	32K	32K	32K	32K	32K	32K
Control storage for cache memory								
Type/words per board	RAM/256	RAM/256	RAM/256	RAM/256	RAM/256	RAM/256	RAM/256	RAM/256
Word size in bits	36	36	36	36	36	36	36	36
No. of words	2048	2048	2048	2048	2048	2048	2048	2048
Access time, nanoseconds	30	30	30	30	30	30	30	30
MOS MAIN MEMORY								
Min. capacity, bytes (GCOS 8)	2,048K	2,048K	2,048K	2,048K	2,048K	2,048K	2,048K	2,048K
Max. capac. bytes (GCOS 8)****	16,384K	16,384K	32,768K	32,768K	32,768K	32,768K	32,768K	65,536K
Min. capacity, bytes (CP-6)	16,384K	16,384K	16,384K	16,384K	16,384K	16,384K	16,384K	16,384K
Max. capacity, bytes (CP-6)	32,768K	32,768K	65,536K	65,536K	65,536K	65,536K	65,536K	65,536K
Min. capacity, bytes (Multics)	—	—	—	—	—	—	—	2,048K
Max. capacity, bytes (Multics)	—	—	—	—	—	—	—	65,536K
Cycle time, nanoseconds	750	750	750	750	750	750	750	750
Access time, nanoseconds	440	440	440	440	440	440	440	440
Words fetched per cycle	2	2	2	2	2	2	2	2
I/O CONTROL								
IOM data rates, bytes per sec.	4,000,000	4,000,000	2,000,000	2,000,000	4,000,000	4,000,000	4,000,000	4,000,000
No. of unit record devices per peripheral processor	8	8	8	8	8	8	8	8
No. of disk drives per peripheral processor	32	32	32	32	32	32	32	32
No. of magnetic tape units per peripheral processor	16	16	16	16	16	16	16	16

*Up to four SCU/IOM in DPS 8/C versions.
**Up to 16 network processors in all DPS 8/C models; maximum number of lines 1,920.
***Not used on DPS 8/C systems; DATANET 8/C used instead.
****Maximum main memory on GCOS systems is 8,192K bytes.

memory. DPS 8 system components interact dynamically and execute asynchronously and simultaneously using a common memory subsystem to help increase system performance. Multiprocessor versions of all models are available. Each basic DPS 8/C includes a processor, one System Control Unit (SCU), one Input/Output Multiplexer (IOM) and one FNP, except for the DPS 8/44CD which has two processors and two SCUs.

The System Control Unit (SCU) 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 (IOMs) are directly connected to the SCU. All central processors are equipped initially with one or two SCUs, except for the DPS 8/44CD, which has two SCUs. The DPS 8/70 can be expanded to four SCUs.

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) interfaces the peripheral processors and front-end communications processors with the system control units. The IOM also controls data transfers betwen I/O devices and main memory concurrently with program execution. The DPS 8 uses several different peripheral processors: a mass storage processor, a multifunction processor (which handles tape units, card readers/punches, and printers) available only on the DPS 8/20, 8/44, 8/47, 8/49, 8/20C, 8/44C, 8/44CD, 8/47C, and 8/49C, and separate magnetic tape and unit

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The Input/Output Multiplexer (IOM) is connected to the System Control Unit and interfaces with all system peripherals and Front-End Network Processors (FNP). The IOM transfers data between I/O or communication subsystems and system memory while the processor continues to run its programs.

Memory systems are based on 64K-bit MOS technology, and each processor has a minimum of two megabytes of memory. The CP-6 systems start at six megabytes in the DPS 8/20C, eight megabytes in the DPS 8/44C, twelve megabytes in the DPS 8/44CD, and 16 megabytes in the DPS 8/50C, 8/52C, 8/62C, and 8/70C. The DPS 8/20 and 8/44 are expandable to eight megabytes of memory under GCOS III, and 16 megabytes under GCOS 8. The DPS 8/47, 8/47C, 8/49, 8/49C, 8/50, 8/52, 8/52M, 8/62, and 8/62M can go up to 32 megabytes, and all DPS 8/70 models to 64 megabytes. The DPS 8/20C, 8/44C, and 8/44CD can go up to 16 megabytes, and the DPS 8/50C, 8/52C, 8/62C, and 8/70C can be increased to 64 megabytes.

The DPS 8 processors also offer a cache (associative) memory for holding the most recently referenced page table words, descriptor controlled access which permits new levels of security and data integrity, virtual storage addressing of greater than 8 trillion bytes, and single/double binary floating point.

The DPS 8 systems also offer reduced energy consumption, BTU output, and floor space requirements. For example, the DPS 8/20 offers one third more performance, 50 percent less power consumption and BTU output, 20 percent less cabinet height, and a 46 percent reduction in floor space when compared to the older Level 66 Model 66/10. The DPS 8/70 in a two-processor configuration delivers about 11 percent more power, requires 22 percent less BTUs and requires 24 percent less floor space than a Model 66/80 in a three-processor configuration.

The DPS 8 and DPS 8/C systems support most Level 66/DPS freestanding peripheral subsystems. Honeywell also provides several peripheral subsystems for the DPS 8, including four mass storage processors that are compatible with all DPS 8 models, a 1.1 billion byte disk drive, and five peripheral processors designed specifically for the DPS 8/20 and 8/44 systems. Peripheral processors for the smaller DPS 8 models include a single- and dual-channel mass storage processor, a magnetic tape processor, a unit record processor for card reader/punch units and printers, and a multi-function processor that supports a combination of tape drives and unit record devices.

A wide variety of peripheral equipment is available from Honeywell, including three different system consoles, six tape drives with numerous configurations, five high-density disk drives, four unit record devices, and five printers.

Communications with remote terminals, as well as remote hosts, is an important element in Honeywell's

record processors. The DPS 8/20, 8/44, 8/47, and 8/49 can be configured with either integrated peripheral processors (contained within the central system cabinet), free-standing peripheral processors, or a combination of both. The DPS 8/50, 8/52, 8/62, and 8/70 can be configured only with free-standing peripheral processors. All systems can have a front-end network processor to support a wide variety of remote devices and communications links.

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 operations 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 GCOS8 and CP-6 provides an extremely large, directly addressable memory space and a 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 be comprised of several pages (tape reels). A domain includes more than one non-contiguous segments 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.

DPS 8 performance is spread through the eight basic models as follows: (1) DPS 8/20 is about twice as powerful as an IBM 4331-1, 1.75 times the Honeywell level 66/05, and 1.33 times the Level 66/10; (2) DPS 8/44 is about the same as the IBM 4341-1, 50 percent faster than the DPS 8/20, and the DPS 8/20 is field upgradable to the DPS 8/44; (3) DPS 8/50 is about 25 percent less powerful than the DPS 8/52, and is field upgradable to the 8/52; (4) DPS 8/52 is over 2 1/2 times as powerful as the DPS 8/20, has about the same performance as the IBM 3031 and the Univac 1100/80 and is field upgradable to either the DPS 8/62 or 8/70; (5) DPS 8/62 has about 35 percent more power than the DPS 8/52, and is field upgradable to the DPS 8/70; (6) DPS 8/70 (single processor version) is twice the power of the Level 66/80 and slightly less than the IBM 3032, while in full four-processor configuration the DPS 8/70 is about the same as the IBM 3033MP. The DPS 8 version equipped with the

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Distributed Systems Environment. Two different 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. Each processor controls message management and handling, and taps the resources of the central processor only when a message is submitted for processing. These processors have common characteristics and differ only in memory size and communications capacity. The DPS 8/20, 8/44, 8/50, 8/52, and 8/62 can accommodate a maximum of four FNPs, and the DPS 8/47, 8/49 and 8/70 can handle up to eight. The DPS 8/C models can support up to 16 FNPs. The DATANET processors can support synchronous, bisynchronous, and asynchronous transmissions, half- and full-duplex modes, and the HDLC protocol. A maximum speed of 72,000 bps is possible.

SOFTWARE AND SUPPORT

The DPS 8 series processors use four different operating systems. The DPS 8/20, 8/44, 8/47, 8/49, 8/50, 8/52, 8/62, and 8/70 systems operate with the virtual memory General Comprehensive Operating Supervisor (GCOS) 8, which was announced along with the DPS 8 systems. All DPS 8 systems can also use GCOS, the predecessor to GCOS 8. The DPS 8/52M, 8/62M, and 8/70M use the Multics operating system. The DPS 8/C systems all use the CP-6 monitor.

GCOS 8 supports several activities concurrently: batch processing, remote job entry (RJE), interactive remote job entry (IRJE), time sharing, transaction processing, direct access to an executing batch program and on-line test and diagnostics. With Honeywell's emphasis toward on-line activities, memory management techniques include dynamic memory management, which controls the physical organization of working spaces of up to four million pages, each page consisting of 4,096 bytes. As many as 477 operations can be handled concurrently under GCOS 8. Descriptor-controlled access to memory allows program access to memory segments whose descriptors GCOS 8 previously placed in the program's descriptor segment. Shared access permits access by two or more processes to segments with fixed data or procedures.

The primary improvements in GCOS 8 over GCOS are the use of virtual memory, improved security mechanisms, and the increased number of concurrent operations supported. GCOS supports up to 55 operations, while GCOS 8 supports up to 477.

GCOS 8 includes a number of data management software products such as Data Management-IV (DM-IV), an integrated set of software modules that supports concurrent access to common, shared data bases in both conversational and procedural modes. DM-IV includes a Data Manager, and an optional Transaction Processor, Query and Reporting Language, Procedural Language Processor, and a Data Dictionary/Directory System. The Multics operating system, as well as the six-model DPS 8/C (CP-6) family, offer substantial performance increases over their earlier counterparts, and are intended as growth paths for users with these operating systems.

The DPS 8 hardware architecture is memory-centered, with the processors and I/O multiplexer (IOM) modules utilizing a common memory subsystem and interface thorugh 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, and provides the various interfaces required by the elements and protocols of a distributed system as well as a facility for dialog 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.

CONTROL STORAGE: See table on DPS 8 system characteristics.

REGISTERS: Each DPS 8 processor includes a large number of processor-accessible registers, as shown on 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
Timer	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

ADDRESSING: 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.

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TABLE 2. MASS STORAGE

Mass Storage Unit Characteristics	MSU0402	MSU0451	MSU0500	MSU0501
Data capacity (millions)				
Formatted characters	117	235	940	1651
Formatted 9-bit bytes	78	156	626	1101
Peak/effective transfer rate (thousands)				
Characters per second	1074/922	1074/922	1597/922	1597/1474
9-bit bytes per second	716/614	716/614	1065/614	1065/983
Access time (ms)				
Minimum seek	8	8	10	10
Average seek	25	30	25	25
Maximum seek	45	55	50	50
Average latency	8.3	8.3	8.3	8.3
Media	Removable	Removable	Fixed	Fixed
Type	M4451	M4451	Included	Included
Spindles per physical unit	1	1	2	2
Logical units per spindle	1	1	2	2
Recording surfaces per logical unit	19	19	19	20
Number of tracks per recording surface including T&D/Alt. tracks	411	815	1630	1686
Spindle speed (rpm)	3600	3600	3600	3600
Options				
Rotational position sensing	MSF0007	MSF0007	Included	Included
Dual-access capability	MSF0006	MSF0006	MSF0011	MSF0011

File Management Supervisor manages allocation of physical file space and controls system and file access. FMS is also an integral part of GCOS 8 system security. A Unified File Access System (UFAS) interfaces between the system's physical devices and logical data management with such functions as buffer management, blocking and deblocking, record location, error checking, and label processing. The DM-IV Transaction Processor (TP) includes software modules that control the information flow between terminal users and the computer. The TP receives a message and dynamically selects the proper processing programs and system resources to ensure prompt transaction completion. Additional programs include the DM-IV Query and Reporting Processor, which permits data base retrieval and report generation; a Text Executive Processor (TEX) for text processing, program execution, and program development; and the Time-Sharing Executive for management of time-sharing operations and electronic mail.

Forthcoming from Honeywell in 1983 will be Personal Data Query Facilities (PDQ) and a Software Disk Cache Buffer (SDCB) to improve system performance.

INSTRUCTION REPERTOIRE: 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, that includes 88 fixed-point binary arithmetic, 20 address register, 29 Boolean, 2 descriptor register, 10 master mode, 17 micro, 29 multiword, 4 pointer register, 18 privileged, 20 transfer of control, and 18 miscellaneous operations.

CACHE MEMORY: 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 processors. The two smaller systems, the DPS 8/20 and 8/44, each have 8K bytes of cache storage available, and the larger units, the DPS 8/47, 8/49, 8/52, 8/62, and DPS 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.

PROCESSOR MODES: The central processor operates in three modes: master mode, privileged master mode, and

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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.
					(In thousands)
MTU0410	7	556/800	NRZI	75	31/45
	9	800/1600	NRZI/PE	75	60/120
MTU0411	7	556/800	NRZI	75	31/45
	9	800/1600	NRZI/PE	75	60/120
MTU0412	7	556/800	NRZI	75	31/45
	9	800/1600	NRZI/PE	75	60/120
MTU0500	7	556/800	NRZI	125	52/75
	9	556/800/1600	NRZI/NRZI/PE	125	70/100/200
MTU0610	9	800/1600/6250	NRZI/PE/GCR	200	160/320/1250
MTU0630	9	800/1600/6250	NRZI/PE/GCR	75 or 125	60/100-120/ 200/-468.7/ 781.2

Printers	Printing Speed	Print Positions	Horizontal Spacing, Chars./Inch	Vertical Spacing Lines/Inch	Form Size, Inches
PRU0901	900 (42-character set)	136	10	6 or 8	4 in. to 19 in. x 3 in. to 11 in.
PRU1201	1200 (64-character set)	136	10	6 or 8	4 in. to 19. in. x 3 in. to 11 in.
PRU1600	1600 (48-character set)	136 or 160	10	6 or 8	4 in. to 19 in. x 3 in. to 11 in.

Card Equipment	Columns	Speed Cards/ Min.	Input Hopper Capacity	Output Stacker Capacity	Options
CRU0501 Card Reader	80	500	1000	1000	
CRU1050 Card Reader	80	1050	3000	2500	51-column read (CRF0003)
CCU0401 Reader/Punch	80	400 (read) 100 to 400 (punch)	1200	1300	
PCU0121 Card Punch	80	100-400[a]	1200	1300	

(a) depends on columns punched

Network communications are handled by either the Network Processing Supervisor (NPS), the GCOS Remote Terminal Supervisor-II (GRTS-II), or Distributed Network Supervisor (DNS). All three systems control remote communications activities such as time-sharing, transaction processing, remote job entry, and direct program access. NPS also offers store-and-forward message switching capabilities for larger networks. DNS, in a DSA network hosted by a GCOS 8 system, supports communications facilities for remote job entry, file transfer to and from a Distributed Systems Satellite (DSS), time sharing, and transaction processing. It also supports the DSS facilities under GCOS 6 of distributed concentration, file transfer, distributed transaction processing, and remote batch as well as local DSS functions such as data entry. DNS is also designed to support public data networks (PDNs), value added networks (VANs), and private networks.

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 tri-modal operation provides effective operating control and security in a multiprogramming environment.

INTERRUPTS: 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.

SYSTEM CONTROL CENTER: One system control center is required for the DPS 8: the CSU6601, a desk-top arrangement with 120-cps printer and a 12-inch 1920-

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GCOS 8 has two maintenance packages to identify problems and minimize downtime. The Honeywell Error Logging and Analysis System (ELAN) detects problems in memory modules, runs a set of diagnostic routines, and prints the result on a summary sheet. The Total On-line Testing System (TOLTS) monitors system components, and calls in diagnostic tests on potential problems. It also has a remote testing capability for Honeywell maintenance engineers. Both systems run concurrently with normal operations and are invisible to users.

Numerous language processors are available with GCOS 8: Cobol-74, Fortran, BASIC, dataBASIC, PL/1, GMAP, GPSS, SIMSCRIPT, Pascal, Compiler "B", LISP, and RPG II. Languages available with Multics include PL/1, APL, Cobol-74, RPG, Fortran, Basic, and the ALM assembler. Languages for CP-6 include Cobol-74, Fortran, APL, Interactive Data Processor (IDP), RPG-II, Basic, PL-6, GMAP, and TEXT.

The Multics operating system is used on the DPS 8/52M, 8/62M, and 8/70M. It uses virtual memory and concurrently supports batch processing, remote job entry (RJE), time sharing, online remote data entry and data base inquiry/updating, word processing, electronic mail, program development, and graphics. The virtual memory moves information between main memory and peripheral storage independently of hardware configuration and without programmer intervention. Multics provides a high level of security through a hardware-based ring structure with different levels of system access. Data base activities are handled by the Multics Data Base Manager (MDBM) and remote data base access is handled by Linus (Logical Inquiry and Update System). WORDPRO provides a full range of word processing capabilities and can operate in conjunction with the Multics Electronic Mail Facility. The latest version of Multics, Release 9, provides additional enhancements to the basic monitor, as well as communications, word processing, and electronic mail.

The CP-6 operating system, an upgrade of the Xerox-based CP-V facility, is used on the DPS 8/20C through 8/70C. CP-6 supports interactive time sharing, on-line transaction processing, local and remote batch processing, and distributed real-time processing. The DPS 8/70C using CP-6 can support up to 500 time sharing users simultaneously.

A wide variety of Honeywell applications programs are available for the DPS 8 systems to handle business, educational, scientific, medical, and financial requirements.

USER REACTION

Preliminary findings on Honeywell's DPS 8 Series from Datapro's 1983 Computer System User Survey have been received. The reader is cautioned, however, that these are only preliminary findings and are subject to change. As of this writing, seven Honeywell users have responded. Four

character CRT (a 23-inch remote display is optional) and keyboard. Optionally, the larger CSU6004 with the same features of the CSU6601 but with an optional 23-inch remote display unit; and the CSU6005, which has two 12-inch screens in the console with an option for up to two 23-inch remote displays may be added. 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. The CRT displays 1920 characters in a matrix of 80 characters per line, 24 lines per display. The printer associated with the CSU6601 operates at 120 cps, and the CSU6004/6005 unit runs at 30 cps, with a 120-cps option.

The CSU6601 has several new options, including 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 screen unit) and Monitor Drive, CSF6605 Ceiling Mount for 23-inch monitor, and CSF6606 Extended System Control Center.

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 F. 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 F. or the relative humidity more than ±5 percent.

INPUT/OUTPUT CONTROL

I/O Channels: The Input-Output Multiplexer (IOM) 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. Data transfers between peripheral devices and memory are also handled by the IOM. All peripheral device operations are controlled by processor-prepared control word lists stored in reserved IOM positions in memory or in the IOM scratchpad 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 scratchpad 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 assigned 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.

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of the seven users had installed the Honeywell DPS 8/44, two had the 8/70, while only one user had a DPS 8/20 installed. All but one firm indicated their systems were installed approximately two years at the central site. Four firms rented or leased from the manufacturer; two leased from a third party; while one 8/44 user purchased his system. These Honeywell systems are installed in five major industries: Manufacturing, Retail/Wholesale, Service Bureau, Transportation and Education. Their principal applications in order of importance involved Accounting/Billing, Order processing/Inventory, Payroll/Personnel, Purchasing, Sales/Distribution and Education-scheduling/administration utilizing for the most part programs written in Cobol as proprietary software or by in-house personnel.

Four of the seven respondents were involved in distributed processing while all seven firms utilized terminals locally.

Interestingly, all seven respondents used both a Data Base Management System and a Communications Monitor. Six firms indicated they plan to expand their data communications facilities both in terms of hardware and software.

Disaster Recovery planning appears high on the respondents' list of priorities, since one firm already had such a plan in place while the other six firms plan to implement such a plan in 1983.

As part of the survey, users were asked to rate their computer system from excellent to poor. A weighted average was then calculated based on the total responses. A summary of these DPS 8 user ratings are as follows:

Just about everyone we interviewed expressed satisfaction about their DPS 8/70s. Negative comments were expressed primarily in the areas of peripherals and hardware/software support. Most of their future plans included more CPUs, more memory, more disk storage, and increased communications. Aside from implementing GCOS 8, most had plans for additional applications during 1982. A summary of DPS 8 user ratings is included in the following table.

	Excellent	Good	Fair	Poor	WA*
Ease of operation	2	3	2	0	3.14
Reliability of mainframe	5	1	1	1	3.71
Reliability of peripherals	1	3	3	0	2.71
Maintenance service:					
Responsiveness	4	2	1	0	3.42
Effectiveness	5	1	0	1	3.43
Technical support:					
Trouble-shooting	0	5	1	1	2.57
Education	0	3	4	0	2.43
Documentation	0	2	5	0	2.29
Manufacturer's software:					
Operating system	4	1	1	1	3.14
Compilers & assemblers	2	4	1	0	3.14
Applications programs	0	3	4	0	2.43

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.

SIMULTANEOUS OPERATIONS: 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.

CONFIGURATION RULES

The DPS 8/20, DPS 8/44, 8/47, and 8/49 central systems are packaged within a single cabinet. The DPS 8/20 (CPS8123), DPS 8/44 (CPS8128), DPS 8/47 (CPS8129), DPS 8/49 (CPS8131), are equipped with two megabytes of main memory, one CPU (two CPUs are optional), one system control unit (SCU), and one IOM with 19 channel slots. One additional SCU and IOM can be configured on the DPS 8/20, 8/44, 8/47, and 8/49 to provide a tandem system with all central system units cross-connected. Memory on DPS 8/20 and 8/44 can be increased up to 16 megabytes through two-megabyte additions (CMM8002). Memory on the DPS 8/47 and 8/49 can also be increased through two-megabyte additions but up to 32 megabytes. All systems are field upgradable.

Up to four Front-End Network Processors (FNPs) and four System Consoles can be supported by the DPS 8/20 and 8/44. The FNPs supported are the DCU6661 and DCU8010. The three consoles supported on all models are CSU6601, CSU6004, and CSU6005.

For CP-6 the DPS 8/20C and 8/44C central systems are also packaged within a single cabinet. The DPS 8/20C (CPS8114), DPS 8/44C (CPS8116), and DPS 8/44CD (CPS8117) are equipped with 6, 8, and 12 megabytes of memory respectively. One CPU and one SCU are included with the DPS 8/20C and 8/44C. Two CPUs and two SCUs are included in the DPS 8/44CD. One IOM is included in each of the DPS 8/20C, 8/44C and 8/44D systems. One additional IOM can be configured on the DPS 8/44CD. Memory can be increased to 8 megabytes on the DPS 8/20C and to 16 megabytes on the DPS 8/44CD in two-megabyte increments (CMM8002). The DPS 8/20C can be field upgraded to the DPS 8/44C, which can be field upgraded to the DPS 8/44CD.

Up to 16 FNPs can be supported by the DPS 8/20C, 8/44C and 8/44CD. The FNP supported is the Datanet 8/C (DCU8011). One FNP is included with each DPS 8/20C, 8/44C and 8/44CD.

All Honeywell Level 66/DPS peripherals are supported on the DPS 8/20 and 8/44, and most 66/DPS peripherals are supported on the DPS 8/20C, 8/44C, and 8/44CD, in addition to four peripheral processors used exclusively for these systems. The Multifunction Processor (MFP8001) includes both unit record and magnetic tape processors, and can support up to four unit record and eight magnetic tape devices. The Unit Record Processor (URP8001) can support up to eight unit record devices. The Magnetic Tape Processor (MTP8001) can support up to eight tape units. The Mass Storage Processor comes in two versions: single-channel (MSP8000) and dual-channel (MSP8002). It can control up to 16 single-spindle or 8 dual-spindle disk drives in 5 specific configurations:

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	Excellent	Good	Fair	Poor	WA*
Ease of programming	2	2	3	0	2.86
Ease of conversion	2	0	4	1	2.43
Overall satisfaction	3	2	2	0	3.14

*Weighted Average based on 4.0 for Excellent.

When asked if their computer system performed as expected, five respondents said "yes," one said "no" and one respondent was undecided. Again when asked if they would recommend their system, six of the seven users said "yes" while one user indicated undecided.□

	Single Spindles		Dual Spindles
Either	16	and	0
or	12	and	2
	8	and	4
	4	and	6
	0	and	8

The central cabinet can include one MSP8000 or MSP8002, and only one MFP8001, MTP8001, or URP8001, as these three units are mutually exclusive. With the addition of a second IOM on the DPS 8/20, 8/20C, 8/44, 8/44C, and DPS 8/44CD, 8/47, 8/47C, 8/49, and 8/49C, additional integrated peripheral processors can be added in the second cabinet. Additional free-standing peripheral processors can be added as desired.

The DPS 8/50, 8/52, DPS 8/62, and DPS 8/70 each have a free-standing central system. The DPS 8/50 (CPS8180), DPS 8/52 (CPS8182), DPS 8/62 (CPS8185), and DPS 8/70 (CPS8188) have two 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 8/50, 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 8/50, 8/52, and 8/62, and 64 megabytes in the DPS 8/70 and 8/70M. The DPS 8/50, 8/52, and 8/62 can all be field upgraded, all the way to the DPS 8/70. The DPS 8/50, 8/52, and 8/62 can support up to four Front-End Network Processors (CDU6661/8010) and four System Consoles (CSU6601, CSU6004, or CSU6005). Up to two CPUs, SCUs, and IOM are offered for the DPS 8/50, 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. Honeywell recommends multiple System Control Units for optimal performance.

For CP-6 the DPS 8/50C, 8/52C, 8/62C, and 8/70C each have a freestanding central system. The DPS 8/50C (CPS8170), 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 8/50C, 8/52C, and 8/62C can all be field upgraded to the DPS 8/70C. The DPS 8/50C, 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 (FNPs) can be supported by the DPS 8/50C, 8/52C, 8/62C, and 8/70C. One FNP is included with each system.

Most peripherals and freestanding peripheral processors available on the Level 66/DPS systems are compatible with the DPS 8/50, 8/50C, 8/52, 8/52C, 8/62, 8/62C, 8/70, 8/70C, and the 8/70M.

MASS STORAGE

MASS STORAGE SUBSYSTEMS: See Table 2.

INPUT/OUTPUT UNITS

MAGNETIC TAPE SUBSYSTEMS: See Table 3.

UNIT RECORD SUBSYSTEM: See Table 3.

PRINTERS: See Table 3.

COMMUNICATIONS CONTROL

DATANET 6661 FRONT-END NETWORK PROCESSOR (FNP): This processor 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 solid-state, 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.

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The Channel Interface Base (CIB) provides the line interfacing arrangements necessary to accommodate terminals with various data transfer rates, bit orders, bits per character, information codes, character sets, message formats and communications control procedures. Terminals in the low, medium, and high speed ranges can be supported, with 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.

DATANET 8 FRONT-END NETWORK PROCESSOR (FNP): This system 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 co-exist with it on the same system. A maximum of two DPS 8 host connections can be configured enabling the DATANET 8 to be shared by two DPS 8 host systems.

The base DATANET 8 includes 512K bytes of memory (expandable to 2048K), a 512K-byte diskette (a second 512K diskette is optional), and can accommodate from 16 up to 128 communication lines. The DPS 8 Host connection (DCE8006) and either the 30-CPS Console (DCF8008) or the 120-CPS Console (DCF8006) are required additions.

Available as options, the DATANET 8 has two performance enhancements which increase processor power. The most recent option, the Extended Processor Performance Enhancement for DCU8010 Network Processor, consists of an additional processor module and associated cache memory module, both to reside in existing DATANET 8 cabinetry. This option, available 1st quarter 1983, can provide a performance factor increment of up to approximately 7% over the base DATANET 8 (DCU8010).

The DATANET 8/C Front-End Network Processor (DCU8011) operates under the control of CP-6. The DATANET 8/C has a maximum of one DPS 8/C host connection. Four remote DATANET 8/Cs can be connected via HDLC lines to one local (host-connected) DATANET 8/C.

The DATANET 8/C includes 512K bytes of memory (expandable to 2 megabytes), a 256K-byte diskette, one Multiple Device Controller (MDC), and can accommodate from 16 up to 128 communication lines.

The DATANET 8 and DATANET 8/C can be configured with two, eight, or sixteen DCF8007 Channel Interface Bases (CIB) depending on the line configuration. Each CIB supports up to four Channel Interfaces, each of which supports either one or two Communication Lines, depending on the specific type of Channel Interface chosen. The following options are available on both 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.
- Dual Synchronous EIA RS-232-C Channel to 9600 bps (DCF8011).
- Dual Asynchronous EIA RS-232-C Channel to 9600 bps (DCH8012).
- Single HDLC EIA RS-232-C Channel to 9600 bps (DCF8020).
- Single HDLC Wideband Channel to 56K bps (DCF8022).
- Single HDLC Wideband Channel, CCITT-V.25 to 56K bps (DCF8023).
- Direct Connect Capability (DCF8024) for one Asynchronous or one Synchronous Line to 9600 bps.
- Universal Modem By-Pass (DCF8026) Synchronous to 20.8K bps or Asynchronous to 1800 bps.
- Two Asynchronous Current Loop Ports, to 9600 bps; FDX only (DCF8036).

The following options are available on the DATANET 8/C and can be field installed.

- CIB and 8 Asynchronous RS-232-C Ports (DCF8030).
- CIB and 8 Synchronous RS-232-C Ports (DCF8032).
- CIB and 8 Current Loop Ports (DCF8034).
- CIB and One Broadband Synchronous Port, Bell 301/303 Compatible, with Modem Cable (DCF8040).
- CIB and One Broadband Synchronous Port, V.35 CCITT Compatible, with Modem Cable (DCF8042).
- CIB and One Broadband HDLC Port, Bell 301/303 Compatible, with Modem Cable (DCF8044).

SOFTWARE

GCOS 8—The primary operating system for DPS 8 systems is the General Comprehensive Operating Supervisor 8 (GCOS 8). It is based on the GCOS operating system. GCOS 8 has a number of enhancements over GCOS such as

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virtual memory, improved security, and increased multiprocessing. According to Honeywell, current users with GCOS can be upgraded to GCOS 8, and user programs which have been running under GCOS will run unchanged under GCOS 8.

GCOS 8 is a user-defined, user-oriented, communications-related operating system with multidimensional, multiprogramming, and multiprocessing 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 document handling, 8) on-line test and diagnostics, 9) on-line program test and development, and 10) electronic mail.

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 each can execute any program. GCOS 8 can address up to 128 megabytes of real memory and up to 8 trillion bytes of virtual memory. Up to 477 user programs of up to 1 megabyte each can be executed concurrently. It provides high throughput by efficient and rapid scheduling of all activities, which reduces operator intervention.

Memory Management: 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. GCOS 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.

DIMENSIONS: GCOS 8 is a virtual operating system, with 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.

System Security: GCOS 8 provides security of hardware and software in several ways. It 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 multi-level 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.

NETWORK PROCESSING SUPERVISOR: The DPS 8 and NPS 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.

DISTRIBUTED NETWORK SUPERVISOR (DNS): DNS has been designed specifically for use in the DATANET 8 Front-End 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 satellite to host support for DM-IV Transaction Processing. 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, in-line tests, and software generation.

DNS supports a variety of terminals such as the Honeywell TWU/PRU 1003, 1005, and 1901, VIP 7100/7200/7200S/

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7700/7700R/7800 and VTS7740. Also supported is the Distributed System Satellite (DSS), a hardware/software system that allows a DPS 6 or Level 6 system to function as a satellite processor and to communicate with a DPS 8 host in a DSA network.

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 50,000 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.

TRANSACTION PROCESSING SYSTEM (TPS): This facility 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.

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): 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.

TIME-SHARING: 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 Multicopy 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, Time-Sharing Fortran, 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.

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. 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.

LANGUAGES: The language processors available for use on the DPS 8 systems under GCOS 8 are Cobol-74, Fortran, Fortran-77, PL/1, GMAP, GPSS, Basic, dataBasic, Simscript, Pascal, Compiler "B", Lisp, APL, and RPG II.

The Cobol-74 compiler provides the functional modules specified for ANS Cobol-74, including the Debug, Sort/Merge, and Report Writer facilities. All modules are implemented on Level 2 except Report Writer and Inter-program Communication, which are implemented on Level 1.

Time-Sharing Fortran is a full implementation of ANSI Fortran IV with extensions. Fortran-77 is a full implementation of the 1978 ANSI standard, and supports the Fortran IV language essentially unmodified. Fortran IV extensions include nonstandard returns from subroutines; optional code optimization; multiple entry points; switch test subroutines; memory-to-memory conversion; seven array dimensions; character type; generalized expressions as subscripts; extended TYPE, PARAMETER, and IMPLICIT statements; list-directed and direct-access I/O; mixed-mode arithmetic; quoted character constants; and Boolean functions. Both Fortran processors compile programs in local, remote job entry, or time-sharing mode and ensures compatibility between source programs developed in one environment and used in another. Data Manipulation Language (DML) verbs for accessing DM-IV and I-D-S/II databases are available.

PL/1 is a block-structured language that allows both internal and external names. This feature facilitates the development and maintenance of modular PL/1 programs. All procedures are recursive and sharable. PL/1 utilizes the full ASCII character set defined in American National Standards Institute standard X3.4-1968.

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Basic is a one-pass conversational compiler that operates under the GCOS 8 Time-Sharing System. It implements the Basic language plus several Honeywell extensions.

DataBasic is a version of Basic employing the I-D-S/I file management system. DataBasic is supported by both time-sharing and batch component subsystems.

APL Level II is a superset version of the APL programming language. APL is an interactive system for use with large-scale Honeywell computers.

The Pascal compiler runs under TSS and provides these extensions to standard Pascal: constant-valued expressions may be used wherever a constant is legal in Standard Pascal, and are evaluated at compile time; files may be opened dynamically; and extended file handling is available.

Lisp is an interpreter/compiler system designed to assist in the symbolic computations common to language translation, theorem proving, symbolic mathematics, and artificial intelligence. It is a compatible superset of Lisp 1.5.

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.

Compiler "B" is a high-level language which operates in the batch or time-sharing mode. It is used for systems programming and for teaching compiler programming and design.

RPG II is Honeywell's implementation of the IBM-developed report program generator, and is very similar to the IBM System/3 version of the language. RPG II supports UFAS sequential, relative, and indexed sequential files, all compatible with Cobol-74.

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.

DATA MANAGEMENT: Honeywell offers a number of software packages in this category, including Data Management-IV, File Management Supervisor, Indexed Sequential Processor, Unified File Access System, Integrated Data Store I & II, Management Data Query System, and Common Files Facility.

The latest Honeywell data management, transaction processing, query and reporting, batch and interactive data base capabilities are provided by Data Management-IV (DM-IV). DM-IV is the evolution of 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 non-data-processing professionals. DM-IV consists of the following functional modules: the Data Manager, the Transaction Processor, the Query and Reporting Processor, and the Procedural Language Processor. It also supports batch and time sharing programs. DM-IV is described in detail in Report 70E-480-01.

The DM-IV Data Manager 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 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 are required. The TP system includes both on-line software components for processing the actual transaction and a wide 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 Data Base 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 DM-IV Query and Reporting Processor (QRP) provides the user with several different 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 non-computer-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. 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 QRP end-user facilities, the user need not be concerned with the data base structure or access methods.

The File Management Supervisor (FMS) provides powerful file management capabilities, including multi-level user

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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 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 access process.

The Data Dictionary/Directory System (DD/DS) is a comprehensive set of software modules that can implement a centralized data dictionary/directory. Data is 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, reports, etc. 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 date 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 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 ANS Cobol-74, and file integrity protection for normal and abort processing.

Integrated Data Store (I-D-S/I and I-D-S/II) are enhanced versions of I-D-S, a data base management system originally developed by GE. I-D-S/II marks the beginning of an evolution of I-D-S toward conformance with the recommendations of the CODASYL Data Base Task Group. I-D-S/II is fully integrated with Honeywell's Cobol-74 compiler, and user interfaces are also implemented for Fortran. I-D-S/II is described in detail in Report 70E-480-01.

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 based retrieval and report generation system, and MDQS/IV, a system that offers all MDQS/II capabilities plus data base creation and maintenance features.

Common Files Facility of GCOS 8 allows up to four independent DPS 8 systems to share all their permanent (non-removable) mass storage devices, thereby sharing the data base. The systems in a shared mass storage configuration share a common scheduling queue, allowing load leveling between the systems.

Personal Data Query (PDQ) Facilities are end-user inquiry facilities available under GCOS 8 by year-end 1983. The PDQ family will have two query facilities and an Application Productivity Facility that interface to data bases and files through the incorporated Relational Access Manager, and a reporting facility that uses data obtained through the query facilities to produce formatted reports useable for browsing, saving for future use, or printing. The two PDQ query facilities are essentially equivalent; they differ in their human interface and their use of terminals.

The Software Disk Cache Buffer (SDCB), will be made available under GCOS 8 release SR2300. Its purpose is to improve system performance by reducing the number of physical input and output data transfers to and from disk storage. The SDCB sets aside a site-controllable portion of main memory as a cache memory buffer to store frequently used data, allowing access at main memory speed rather than at disk storage I/O access transfer speed.

ELAN: The Honeywell Error Logging and Analysis System is a software system that works in conjunction with TOLT, GCOS, 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.

TOTAL ON-LINE TESTING: TOLT is a test and diagnostic system that runs under GCOS. Its objective is to improve the system's reliability and availability through the use techniques. TOLT monitors and saves all error status information, makes periodic surveillance checks of various hardware modules, and calls in specific diagnostic tests and on-line troubleshooting programs.

MULTICS SOFTWARE

The DPS 8/52M, 8/62M, and 8/70M computer systems use 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 storage, 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.

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 1024 words, and paging is performed automatically by the Multics

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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 faciliated 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.

Languages available to Multics users include PL/1, APL, Cobol-74, MRPG, Fortran, Basic, and the ALM assembly language. In addition, the system includes a wide variety of utility programs, including text editors, debugging aids, performance measurement tools, interuser communication facilities to permit messages to be transmitted among users, and on-line documentation of system software and user programs.

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 nonprecedural 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.

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 sytem, 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.

CP-6 SOFTWARE

The DPS 8/C computer systems use the 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 multi-programmed local and remote batch processing.

CP-6 provides a memory mapping system for up to 512 program working spaces and 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 advantages 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 online 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 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 utilizing 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, as well as to create, modify, and delete files. File and program security are provided for each user.

The comprehensive, 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 online 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 wide 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.

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Languages available under CP-6 include ANS 1977 Fortran, ANS Cobol-74, APL, Interactive Data Processor (IDP), RPG-II, Basic, PL-6, GMAP (Macro Assembly Program), and TEXT. These languages can generate reentrant code where desired. Regardless of the compiler being used, debugging is performed symbolically using a centralized debugger with simple, user-oriented commands. CP-6 also includes a Sort/Merge utility and support for the I-D-S/II DBMS.

PRICING

EQUIPMENT: The following systems are representative of the different DPS 8 configurations possible.

TYPICAL MODEL DPS 8/20 SYSTEM: Consists of a CPS8123 central processor with two megabytes of main memory, integrated input/output multiplexer with 19 channel slots, and one system control unit, a CSU6601 system console with 120 cps printer, one MSP8000 integrated mass storage processor, two MSU0451 disk drive (400 megabytes), one MFP8001 integrated multifunction processor, and one PRU0901 line printer (900 lpm). Purchase price is approximately $359,251, monthly maintenance is $1,360, and the three-year lease price per month is $12,973.

TYPICAL MODEL DPS 8/52 SYSTEM: Consists of a CPS8182 central processor with four megabytes of memory, IOM with 36 slots, and one SCU, a CSU6601 system console, one MSP0611 mass storage processor with four MSU0500 disk drives (2,500 megabytes), one MTP0611 magnetic tape processor with two MTU0500 dual-density tape drives, one URP0600 unit record processor with one PRU1201 line printer (1200 lpm) and one CRU0501 card reader (500 cpm). Purchase price is approximately $861,563, monthly maintenance is $3,817, and the three-year lease price per month is $38,451.

TYPICAL MODEL DPS 8/70 SYSTEM: Consists of a single-processor CPS8188 with eight megabytes of memory, one IOM with 36 slots, one SCU, one CSU6601 console and one CSU6602 auxiliary console, each with 120-cps printer, two dual-channel MSP0612 mass storage processor with eight MSU0500 disk drives (10,016 megabytes), one MTP0611 tape processor with four dual-density MTU0500 tape drives, one URP0600 unit record processor with two PRU1201 line printers (1200 lpm) and one DCU8010 front-end network processor. Purchase price is approximately $2,364,114, monthly maintenance is $9,873 and the three-year lease price per month is $84,894.

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.

System engineering falls into one of five billable support categories, as described in the following table. Field engineering managers are responsible for the degree of skill required to perform the job.

	Hourly Rates	Monthly Rates
Principal or senior technical consultant	$125	$17,431
Project supervisor or technical consultant	102	14,230
Technical specialist	91	12,807
Systems analyst/senior programmer	77	10,672
Programmer	54	7,471

Hourly charges are for a four-hour minimum. The monthly rates do not include supplies.

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.

Education services include standard courses, advanced professional training, multi-media self-instruction courses so that customers can self-train as often as needed, site surveys to determine educational requirements, on-site clases, 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. Multi-media self-instruction courses can be purchased for prices ranging from $18 to $995.

CONTRACT TERMS: DPS 8 equipment, except DPS 8/47 and 8/49, is available for purchase or for rental under a 1-year, 3-year, or 5-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 man-hour.

The DPS 8/47 and 8/49 are available for purchase or for rental under a 1-year, or 4-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% of the base maintenance charge.

Honeywell's Distributed Maintenance Services provides users with remote testing and diagnostic facilities. Headquartered in Phoenix, Arizona, 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 trouble-shooting; 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.

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Honeywell DPS 8 Series

EQUIPMENT PRICES

PROCESSORS

		Purch. Price	Mo. Maint.	1-Year Lease*	3-Year Lease*	5-Year Lease*
CPS8123	DPS 8/20 Central System; single cabinet; two megabytes memory	$149,350	$ 321	$ 6,320	$ 5,863	$ 5,211
CPU8123	Additional CPU for CPS8123; maximum of one	69,000	291	2,907	2,689	2,432
CPS8128	DPS 8/44 Central System; single cabinet; two megabytes memory	198,000	535	9,169	8,509	7,536
CPU8128	Additional CPU for CPS8128; maximum of one	130,350	219	5,016	4,575	4,065
CPS8180	DPS 8/50 Central System; freestanding; two megabytes memory	285,000	977	14,951	13,911	12,363
CPU8180	Additional CPU for CPS8180; maximum of one	228,000	556	8,049	7,275	6,661
CPS8182	DPS 8/52 Central System; freestanding; two megabytes memory	450,000	1,543	23,607	21,965	19,520
CPU8182	Additional CPU for CPS8182; maximum of one	340,000	830	12,003	10,849	9,934
CPS8185	DPS 8/62 Central System; freestanding; two megabytes memory	680,000	2,314	27,697	25,772	23,615
CPU8185	Additional CPU for CPS8185; maximum of one	500,000	1,415	20,476	18,506	16,946
CPS8188	DPS 8/70 Central System; freestanding; two megabytes memory	900,000	3,664	41,403	38,533	35,272
CPU8188	Additional CPU for CPS8188; maximum of three	655,000	2,724	31,499	28,469	26,068
CPS8114	DPS 8/20C Central System; single cabinet; six megabytes memory; FNP	219,918	1,121	7,991	7,468	6,683
CPU8114	Additional CPU for CRS8114; maximum of one; requires MXK8007	69,000	244	2,932	2,714	2,457
CPS8116	DPS 8/44C Central System; single cabinet; eight megabytes memory; FNP	316,463	1,449	11,335	10,582	9,453
CPU8116	Additional CPU for CPS8116; maximum of one; requires MXK8007	130,350	253	5,050	4,609	4,099
CPS8117	DPS 8/44CD Dual Processor Control System; two cabinets; twelve megabytes memory; FNP	577,188	2,219	20,249	18,876	16,816
CPS8170	DPS 8/50C Central System; freestanding; 16 megabytes memory; FNP	429,888	1,928	20,215	18,841	16,794
CPU8170	Additional CPU for CPS8170; maximum of one	228,000	670	8,163	7,389	6,775
CPS8173	DPS 8/52C Central System; freestanding; 16 megabytes memory; FNP	780,198	3,147	27,518	25,662	22,878
CPU8173	Additional CPU for CPS8173; maximum of one	340,000	1,018	12,191	11,037	10,122
CPS8174	DPS 8/62C Central System; freestanding; 16 megabytes memory; FNP	949,023	3,763	33,408	31,150	27,764
CPU8174	Additional CPU for CPS8174; maximum of one	580,000	1,622	20,683	18,713	17,153
CPS8178	DPS 8/70C Central System; freestanding; 16 megabytes memory; FNP	1,346,287	5,250	47,304	44,101	39,298
CPU8178	Additional CPU for CPS8178; maximum of five	892,232	2,976	31,751	28,721	26,310
CPS8193	DPS 8/52M Central System; freestanding; eight megabytes	450,000	2,100	20,500	19,500	18,000
CPU8193	Additional CPU for CPS8193; maximum of one	340,000	830	12,000	10,800	9,950
CPS8194	DPS 8/62M Central System; freestanding; eight megabytes of memory	725,000	2,900	29,250	27,250	2,500
CPU8194	Additional CPU for CPS8194; maximum of one	500,000	1,415	20,500	18,500	16,950
CPS8199	DPS 8/70M Central System; freestanding; eight megabytes memory	950,000	4,300	43,775	41,500	38,000
CPU8198	Additional CPU for CPS8199; maximum of five	660,000	2,976	34,251	31,000	28,310
CPS8129	DPS 8/47 Central System; integrated, two megabytes memory	153,000	500	8,800	**7,400	—
CPU8129	Additional CPU for CPS8129; requires MXK8007	125,000	206	5,700	**5,000	—
CPS8131	DPS 8/49 Central System; integrated; two megabytes memory	235,000	662	12,075	**10,000	—
CPU8131	Additional CPU for CPS8131; requires MXK8007	175,000	308	8,000	**7,000	—

PROCESSOR OPTIONS

MXC8002	Additional freestanding System Control Unit; for CPS8170/8173/8174/8178/8180/8182/8185/8188/8198; maximum of three; includes all necessary addressing	57,788	110	1,914	1,777	1,571
MXC8003	Additional five-port System Control Unit; for CPS8114/8116/8123/8128/8129/ 8131/8117/8119/8121	27,050	54	898	834	**738
MXK8007	System Control Unit Five Port Expansion Kit; for CPS8114/8116/8123/8128	21,669	43	719	668	***590
MXU8002	Additional Input/Output Multiplexer; for CPS8170/8173/8174/8178/8180/8182/ 8185/8188/8198; includes necessary addressing	137,500	131	4,132	4,011	3,719
MXU8003	Additional Input/Output Multiplexer; for CPS8123/8124/8126/8127/8128/8129/8131/8114/8116/8117/8119/8121	84,380	205	2,840	2,639	***2,338
MXF8005	IOM Channel Expansion from 36 to 54 Channel Function Slots	53,255	108	1,297	1,272	1,233
RSF8001	Redundant System Facility for CPS8119/8121/8129/8131; prerequisite MXK8007 (5-port expansion) installed in each SCU	50,000	—	2,775	—	**2,275
MXK8009	SCU Expansion Kit (5-to-8 Port.); required for 3-4 processor configurations	10,791	21	356	—	**295
MXK8007	SCU 5 Port Expansion Kit for CPS8114/8116/8123/8128; required when configuring CM66, an additional processor, or an additional IOM	21,669	43	719	590	—
CPK8128	System upgrade from DPS 8/20 to 8/44	48,650	214	2,849	2,646	2,325
CPK8118	Additional CPU upgrade; DPS 8/20 to 8/44	61,350	—	2,109	1,886	1,633
CPK8113	System upgrade from DPS 8/20C to 8/44C	87,920	318	3,064	2,855	2,541
CPK8114	System upgrade from DPS 8/44 to 8/44CD	260,725	813	8,957	8,337	7,406
CPK8119	Additional CPU upgrade; DPS 8/20C to 8/44C; requires CPK8113	61,350	9	2,118	1,895	1,642
CPK8160	System upgrade from DPS 8/50 to 8/52	165,000	566	8,656	8,054	7,157

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EQUIPMENT PRICES

		Purch. Price	Mo. Maint.	1-Year Lease*	3-Year Lease*	5-Year Lease*
PROCESSORS (Continued)						
CPK8161	Additional CPU upgrade; DPS 8/50 to 8/52	112,000	274	3,954	3,574	3,273
CPK8163	System upgrade from DPS 8/52 to 8/62	230,000	771	4,300	4,200	4,095
CPK8185	Additional CPU upgrade; DPS 8/52 to 8/62	160,000	585	8,473	7,657	7,012
CPK8171	System upgrade from DPS 8/62 to 8/70	220,000	1,350	13,706	12,761	11,657
CPK8188	Additional CPU upgrade; DPS 8/62 to 8/70	155,000	1,309	11,023	9,963	9,122
CPX8176	System upgrade from DPS 8/50C to 8/52C	165,000	591	8,681	8,079	7,182
CPK8177	Additional CPU upgrade; DPS 8/50 to 8/52C	112,000	348	4,028	3,648	3,347
CPK8164	System upgrade from DPS 8/52C to 8/62C	118,825	556	4,268	3,985	3,561
CPK8174	Additional CPU upgrade; DPS 8/52C to 8/62C	240,000	604	8,492	7,676	7,031
CPK8172	System upgrade from DPS 8/62C to 8/70C	397,264	1,487	13,897	12,952	11,534
CPK8178	Additional CPU upgrade; DPS 8/62C to 8/70C	312,232	1,354	11,068	10,008	9,167
CPK8194	System upgrade from DPS 8/52M to to 8/62M	275,000	800	8,750	7,750	7,000
CPK8195	Additional CPU upgrade from DPS 8/52M to 8/62M	160,000	585	8,500	7,700	7,000
CPK8197	System upgrade from DPS 8/62M to 8/70M	225,000	1,400	14,525	13,250	13,000
CPK8198	Additional CPU upgrade from DPS 8/62M to 8/70M	160,000	185	13,751	13,000	11,360
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
MGS6001	Motor Generator and Control Unit; 31.3 KVA, 60 Hz, 208/440 VAC input	17,750	65	416	403	371
MGS6002	Motor Generator and Control Unit; 62.6 KVA, 60 Hz, 440/480 VAC input	21,000	78	500	484	447
MGS6003	Motor Generator and Control Unit; 62.6 KVA, 50 Hz, 380 VAC input	22,150	81	526	512	467
MGS6004	Motor Generator and Control Unit; 62.6 KVA, 60 Hz, 208 VAC input	21,000	78	500	484	447
PSS6700	Control Unit Power, Battery Backup; DPS 8/C Systems	12,000	45	NA	NA	NA
PSS8000	Capacitor Ride-Through 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						
CMM8001	Additional one megabyte of memory for CPS8124/8126/8127/8116/8117/8123/8128/ 8131	10,000				
CMM8002	Additional two megabytes of memory for CPS8124/8126/8127/8116/8117/8123/8128/8129/8131	20,000	42	1,134	1,037	**939
CMM8003	Additional four megabytes of memory for CPS8124/8126/8127/8116/8123/8128/8131	40,000				
CMM8011	Additional one megabyte of memory for CPS8155/8183/8187/8197/8803	25,000				
CMM8012	Additional two megabytes of memory for CPS8155/8183/8187/8197/8803 (CMM8011 is a prerequisite)	50,000				
CMM8013	Additional four megabytes of memory for CPS8155/8183/8187/8197/8803 (CMM8012 is a prerequisite)	100,000				
CMM8014	Additional eight megabytes of memory for CPS8187/8197/8803 (CMM8013 is a prerequisite)	200,000				
CMM8020	Additional two megabytes of memory for CPS8170/8173/8174/8178/8180/8182/8185/ 8188/8198/8193/8194/8199	50,000	120	3,243	3,005	2,684
PERIPHERAL PROCESSORS						
MSP8000	Integrated Single Cabinet Mass Storage Processor for CPS8114/8116/8177/8123/8128 systems	46,800	108	1,749	1,624	1,439
MSP8002	Dual Channel Mass Storage Processor for CPS8114/8116/8177/8123/8128	64,375	168	2,268	2,109	1,870
MSF8000	Device Adapter for MSU0400/402/451 on MSP8000 only	3,500	NC	159	146	132
MSA8000	Addressing capability for four MSU0400/0402/0451 for MSP8000 only	4,100	16	231	212	199
MSA8001	Addressing capability for two MSU0500/0501 for MSP8000 only	6,000	16	234	218	193
MSK8000	Upgrade Kit, MSP8000 to an MSP8002	24,440	60	917	853	756

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EQUIPMENT PRICES

		Purch. Price	Mo. Maint.	1-Year Lease*	3-Year Lease*	5-Year Lease*
PERIPHERAL PROCESSORS (Continued)						
MSF8001	Device Adapter for an attachment of up to sixteen MSU0400/0402/0451 for MSP8001 only	6,000	NC	263	241	229
MSA8002	Addressing capability for four MSU0400/0402/0451 for MSP8002 only	4,100	18	212	195	183
MSA8003	Addressing capability for two MSU0500/0501; for MSP8002 only	6,300	18	229	213	189
MSF8002	Non-Simultaneous (switched) Datanet Channel for MSP8000/8002	8,158	15	280	260	231
MSF8003	Non-Simultaneous (switched) IOM channel for MSP8000/8002	8,158	15	280	260	231
MFP8001	Integrated Multi-Function Processor for Magnetic Tape/Unit Record for CPS8114/8116/8117/8123/8128 only; supports 8 magnetic tape units, 4 punched card/printer devices	36,086	169	1,338	1,250	1,117
MTP8001	Integrated Magnetic Tape Processor for CPS8114/8116/8117/8123/8128 only; single channel, 8 magnetic tape unit limit; cannot be used with URP8000 or MFP8001	28,060	151	1,061	991	888
URP8000	Integrated Unit Record Processor for CPS8114/8116/8117/8123/8128 only; supports 8 UR devices; cannot be used with MTP8001 or MFP8001	26,250	29	848	786	712
URP8001	Unit Record Processor (for up to 2-PRU0901/1201 Printers and 2 Card Units)	6,500	6	209	194	188
URP8002	Unit Record Processor (for up to 2 Card Units)	4,000	3	128	118	104
URP8003	Unit Record Processor (for up to 2-PRU0901/1201 Printers)	4,000	3	128	118	104
MSP0611	Free Standing Single Channel Mass Storage Processor	50,000	123	1,819	1,690	1,498
MSP0612	Dual Channel Mass Storage Processor	64,375	168	2,120	1,971	1,748
MASS STORAGE						
MSU0400	Removable-Disk Mass Storage Unit, 100M bytes	16,500	122	799	750	677
MSU0402	Removable-Disk Mass Storage Unit, 100M bytes	20,805	113	880	824	757
MSU0451	Disk Mass Storage Unit, 200M bytes; requires MXF6002 IOM data rate expansion and includes rotational position sensing	27,047	113	1,140	1,064	950
MXF6002	IOM Data Rate Expansion Unit	23,720	47	621	600	552
MSK4025	Upgrade Kit from MSU0402 to MSU0451	6,242	—	312	285	271
MSF0006	Dual Access Feature for MSU0402/0451	2,070	13	89	83	76
MSF0007	Remote Position Sensing Option for MSU0402/0451	2,025	13	87	82	76
MSF1023	Device Adapter for MSU0402/MSU0451	11,475	32	423	386	366
MSU0500	Dual Fixed Disk Mass Storage Unit, 940 million characters; includes disk and RPS	38,850	172	1,386	1,293	1,154
MSU0501	Dual Spindle Fixed Disk Drive; 1.1 billion bytes	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
MSF1024	Device Adapter for MSU0500	20,000	30	750	681	648
MSF1034	Drive Expansion for MSU0500; required for more than 8 MSU0500s	12,690	14	335	—	308
MSF1037	Device Adapter for MSU0500	—	—	—	—	—
MAGNETIC TAPE EQUIPMENT						
MTP0611	Magnetic Tape Processor; DPS 8 (1x8); includes IOM channel; for MTU0400/0411/0412/0500/0610	29,400	162	1,080	995	905
MTU0410	Magnetic Tape Unit (75 ips)	12,410	149	552	521	472
MTU0411	Additional Magnetic Tape Unit for MTU0412 (75 ips)	11,473	187	555	526	482
MTU0412	Magnetic Tape Unit, Cluster for Two (75 ips)	22,946	377	1,112	1,054	965
MTU0500	Magnetic Tape Unit (125 ips)	17,441	153	725	680	613
MTU0610	Magnetic Tape Unit (200 ips)	21,000	146	801	751	677
MTU0630	Magnetic Tape Unit (75 or 125 ips)	14,815	130	593	557	505
Features for the MTU0410:						
MTF0111	Nine-track, 1600 bpi	3,060	21	94	—	81
MTF0112	Nine-track, 800/1600 bpi	3,940	70	195	185	170
MTF0113	Seven-track, 200/556/800 bpi	6,000	110	289	272	248
MTF0115	Seven-track, 200/556 bpi	3,060	21	94	—	81
Features for the MTU0411/0412:						
MTF0117	Nine-track, 800/1600 bpi	1,685	10	65	60	54
MTF0118	Seven-track, 556/800 bpi	1,685	10	62	56	52

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EQUIPMENT PRICES

		Purch. Price	Mo. Maint.	1-Year Lease*	3-Year Lease*	5-Year Lease*
MAGNETIC TAPE EQUIPMENT (Continued)						
Features for the MTU0500						
MTF0011	Nine-track, 1600 bpi	3,060	21	94	—	81
MTF0012	Nine-track, 800/1600 bpi	4,137	65	198	187	171
MTF0013	Seven-track, 200/556/800 bpi, NRZI	6,300	106	305	287	260
MTF0015	Seven-track, 200/556 bpi	3,060	21	94	—	81
MTF0016	Seven-track, 556/800 bpi, NRZI	3,213	38	139	126	120
MTF0017	Nine-track, 200/556/800/1600 bpi	6,300	106	305	287	260
Features for the MTU0630						
MTF0634	75 ips, PE/NRZI feature	4,725	138	286	274	257
MTF0635	75 ips, PE/GCR feature	7,110	120	342	325	300
MTF0636	125 ips, PE/NRZI feature	9,805	155	460	435	398
MTF0637	125 ips, PE/GCR feature	10,330	137	460	435	398
MTK0630	Performance upgrade MTF0634 to MFT0635	2,385	—	75	70	60
MTK0631	Performance upgrade MTF0636 to MTF0637	1,700	—	55	50	45
MTK0632	Performance upgrade MTF0634 to MTF0636	5,080	17	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 MTU0400/0410/0500/0600/0610/0630; 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	6	81	75	66
MTF1152	Switched Channel; includes IOM channel (one required for each MTP0611/MTF1151)	6,174	7	199	185	163
MTF1151	Dual Simultaneous Channel; adds 2nd channel to MTP0611; allows up to 16 Magnetic Tape Units; includes IOM channel	36,028	105	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	12	114	107	95
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	3	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	15	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	62	254	239	217
PUNCHED CARD/PRINTER EQUIPMENT						
URF0040	Unit Record Addressing Expansion for URP0600/0601/0602 and URP8000; required if more than four devices used or if drum and belt printers are mixed; accommodates four additional devices	983	2	32	30	26
URA0050	Addressing capability for PCU0120/0121 and CCU0401; are required for each device	4,253	4	140	129	114
URA0052	Addressing capability for CRU1050; one required for each device	7,569	43	279	261	238
URA0053	Addressing capability for PRU0900; 1100; one required for each device	1,701	13	66	62	56
URA0054	Addressing capability for PRU1200; 1201; one required for each device	7,167	18	224	224	204
URA0055	Addressing capability for PRU1600; one required for each device	7,167	18	224	224	204
URA0056	Addressing capability for CRU0501; one required for each device	265	NC	8	7	6
UNIT RECORD PROCESSORS & FEATURES						
URP0600	Unit Record Processor, free-standing, includes basic 4-port adapter and IOM channel	26,585	40	870	829	732
URP0602	Integrated Unit Record Processor for use with free-standing IOM; includes basic 4-port adapter and IOM channel; limits IOM capacity to 35 channel function slots	20,540	32	691	671	592
URF0040	Unit Record Addressing capability; 4 additional port attachments; expands URP to maximum of 8 ports; also required if printer types are mixed in one subsystem (PRU1200 and PRU1600 are considered one type in this definition)	983	2	32	30	26
URF0041	Dual Switched Channel; includes IOM channel; maximum of one	8,898	15	292	271	240

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Honeywell DPS 8 Series

EQUIPMENT PRICES

		Purch. Price	Mo. Maint.	1-Year Lease*	3-Year Lease*	5-Year Lease*
LINE PRINTERS						
PRU0901	Printer (900 lpm)	36,820	402	1,636	1,541	1,428
PRU1200	Printer (1200 lpm)	44,420	386	2,045	1,968	1,779
PRU1201	Printer (1200 lpm)	42,700	428	1,903	1,793	1,629
PRU1600	Printer (1600 lpm)	64,940	538	2,910	2,735	2,472
PRF0022	24 Additional Print Positions for PRU1600	2,610	15	104	97	86
PRF0045	Static Eliminator	865	2	31	29	26
PRK0901	Performance Upgrade Kit; from PRU0901 to PRU1201	6,000	47	253	238	215
PUNCHED CARD EQUIPMENT						
CRU0501	Card Reader (500 cpm)	19,500	114	684	638	568
CRU1050	Card Reader (1050 cpm)	26,555	224	1,136	1,066	961
PCU0120	Card Punch (100-400 cpm)	20,032	147	816	741	687
PCU0300	Card Punch (300 cpm); not available on 66/85	40,544	501	1,868	1,761	1,601
CCU0401	Card Reader/Punch (100-400 cpm)	29,594	219	1,228	1,150	1,032
CRF0003	51-Column Read Feature (80-col.) for CRU1050	2,079	6	75	69	62
CRF0005	Mark Sense Option for CRU1050	7,416	40	198	—	171
CCK0401	Retrofit Kit; upgrades PCU0121 to PCU0401	9,562	76	328	373	334
URA0050	Addressing capability for PCU0121 and PCU0401	4,253	4	140	129	114
URA0052	Addressing capability for CRU1050	7,569	43	279	261	238
DOCUMENT HANDLER SUBSYSTEMS						
DHP0700	Document handler processor for DHU0800/DHU1600 Series	116,000	407	3,444	3,335	3,086
DHP0701	Document handler processor for DHU0803/0814 and DHU1600 Series	58,600	197	1,836	1,677	1,594
DHU0803	Document reader/sorter; 3 pockets; 830 dpm	32,240	350	993	971	943
DHU0814	Document reader/sorter; 14 pockets; 830 dpm	50,877	462	2,284	2,142	1,931
DHU1604	Document reader/sorter; 4 pockets; 1625 dpm	53,102	627	1,755	1,689	1,545
DHU1608	Document reader/sorter; 8 pockets; 1625 dpm	68,890	785	2,188	2,114	1,928
DHU1612	Document reader/sorter; 12 pockets; 1625 dpm	84,677	941	2,634	2,529	2,319
DHU1616	Document reader/sorter; 16 pockets; 1625 dpm	100,464	1,098	3,074	2,955	2,703
DHA6002	Addressing for second DHU0803 or DHU0814 document reader/sorter	8,900	31	280	255	243
DHF6001	Document handler channel for DHU1600 document reader/sorter	4,800	7	145	141	130
DHF6003	Document handler channel for DHU0800	4,800	7	145	141	130
DHF6004	Document handler control console channel and adapter	6,160	74	207	194	179
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
OPTIONS FOR DATANET 6661 PROCESSOR						
DCF6609	Channel Interface Base; accommodates all channel types except HDLC	1,501	8	52	51	49
DCF6611	Dual Synchronous Channel Package, EIA-RS-232-C	1,450	7	56	52	46
DCF6612	Dual Asynchronous Channel Package, EIA-RS-232-C	590	4	24	23	21
DCF6613	Automatic Call Unit, Dual Channel	1,180	4	43	41	36
DCF6614	MIL STD 188C Synchronous Channel	1,501	8	58	55	49
DCF6618	Dual Binary Synchronous Channel Package	1,450	7	56	52	46
DCF6619	Broadband Channel	3,056	12	116	108	96
DCF6620	HDLC Voice-Grade Channel	2,573	11	98	92	82
DCF6621	Bisynchronous Broadband Channel	3,056	12	116	108	96
DCF6624	Direct Connect Capability, asynchronous	350	1	12	12	10
DCF6625	Direct Connect Capability, synchronous	480	1	16	15	14
DCF6627	Broadband Channel, CCITT V.35 to 50,000 bps	3,430	12	129	119	106
DCF6927	Universal Modem Bypass, Synchronous to Asynchronous; to 20.8K bps	415	11	28	28	22
DCF6607	Channel Interface Base	1,651	9	65	60	54
DCF6610	20mA Current Loop-Dual Channel Package	1,180	4	43	41	36
DCF6615	MIL-STD 188C Asynchronous Dual Channel	1,501	8	58	55	49
DCF6616	MIL-STD 188C Broadband Channel	1,501	8	58	51	49

**Includes equipment maintenance.*
***4-year lease.*
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EQUIPMENT PRICES

		Purch. Price	Mo. Maint.	1-Year Lease*	3-Year Lease*	5-Year Lease*
OPTIONS FOR DATANET 6661 PROCESSOR (Continued)						
DCF6617	MIL-STD 188C HDLC Channel	2,573	11	98	92	82
DCF6622	HDLC Broadband Channel	3,056	12	116	108	96
DCF6623	HDLC Channel, CCITT-V.35	3,430	12	129	119	106
DATANET 8 FRONT-END NETWORK PROCESSOR						
DCU8010	Processor; includes 256K bytes of memory, system support controller, 256K bytes diskette drive, up to 16 channel interface bases	29,000	135	1,040	971	868
DCP8010	Extended processor performance/enhancement for DCU8010; prerequisites are DCE8003/8004 (one-time field installation charge $828)	18,500	86	664	620	554
OPTIONS FOR DATANET 8 PROCESSOR						
DCM8004	Additional 256K bytes of memory	7,000	70	288	271	247
DCM8005	Additional 512K bytes memory	6,000	21	576	542	494
DCM8008	Additional 512K bytes memory for DCU8010 only; prerequisites are DCE8002 and DCM8005	6,000	21	576	542	494
DCE8003	Processor Power Module Enhancement for DCU8010; prerequisite is DCE8002	7,400	40	271	—	****227
DCE8002	Communications Line Expansion from 16 to 64 lines	3,000	5	98	91	80
DCE8004	Communications Line Exansion from 64 to 128 lines; requires DCE8002/8003	5,000	10	166	154	136
DCE8005	Additional 256K diskette unit	1,785	18	73	69	63
DCE8006	DPS 8 Host Connection; maximum of two	8,000	65	314	295	267
DCF8007	Channel Interface Base; maximum of 16	2,500	14	92	86	77
DCF8008	30 cps console for DCU8010	2,520	54	132	126	117
DCF8006	120 cps console for DCU8010	2,888	92	182	175	165
DCF8011	Dual Synchronous Channel; EIA RS-232-C; to 9600 bps	1,500	8	54	51	45
DCF8012	Dual Asynchronous Channel; EIA RS-232-C; to 960 bps	1,000	5	36	33	30
DCF8020	HDLC EIA-RS-232-C Channel; to 9600 bps	1,500	8	54	51	45
DCF8022	HDLC Wideband Channel; to 56K bps	3,000	16	109	102	91
DCF8023	HDLC Wideband Channel; CCITT V.35; to 56K bps	3,000	16	109	102	91
DCF8024	Direct Connect Capability, asynchronous or synchronous; to 9600 bps	350	2	13	12	11
DCF8026	Universal Modem By-Pass, asynchronous or synchronous; to 20.8K bps	415	2	15	14	12
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	1,041	972	869
OPTIONS FOR DATANET 8/C PROCESSOR						
DCF8030	Channel Interface Base and 8 Asynchronous RS-232-C Ports	6,000	37	224	210	189
DCF8032	Channel Interface Base and 8 Synchronous RS-232-C Ports	7,700	49	290	272	244
DCF8034	Channel Interface Base and 8 Current Loop Ports	6,000	37	224	210	189
DCF8036	Two Asynchronous Current Loop Ports; Direct Connect to 9,600 bps (no CIB)	1,000	6	38	35	32
DCF8038	Channel Interface Base and One Broadband Synchronous Port, 301/303 Compatible, with Modem Cable	4,500	23	164	153	137
DCF8040	Channel Interface Base and One Broadband HDLC Port, V.35 CCITT Compatible, with Modem Cable	5,500	28	200	186	167
DCF8042	Channel Interface Base and One Broadband HDLC Port, V.35 CCITT Compatible, with Modem Cable	4,500	23	164	153	137
DCF8044	Channel Interface Base and Broadband HDLC Port, 301/303 Compatible, with Modem Cable	5,500	28	200	186	167

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SOFTWARE PRICES

GCOS/GCOS 8 SYSTEMS

		Monthly License Fee	Optional Support Service
SVC8005	ITP Gateway Option	*NC	*NC
SVD8001	DM-IV Fortran Subschema Translator Option	$ 133	$ 11
SVC8002	DM-IV TP Facility	1,543	186
SVP8003	DM-IV QRP Option	417	66
SVP8004	DM-IV PLP Option	292	50
SVS8003	DM-IV TP Comprehensive Facility	3,061	429
SVS8004	DM-IV ITP Comprehensive Facility	3,153	434
SVL8000	Cobol-74 Compiler & Runtime Facility	262	26
SVL8001	Fortran Compiler & Runtime Facility	354	50
SVR8001	Fortran Runtime Facility	122	16
SVL8002	PL/1 Compiler & Runtime Facility	285	50
SVR8002	PL/1 Runtime Facility	77	11
SVP8005	Debug Support System	55	6
SVL8003	RPG-II Facility	133	5
SVU8002	Sort/Merge Facility	107	17
SVC8006	Host File Transceiver Facility for L6	16	6
SVL8004	Host Resident Program Development Facility for L6	445	88
SVL8005	Host Resident Advanced Fortran Facility for L6	237	46
SVL8006	Host Resident Cobol Facility for L6	237	46
SVE8020	Multicopy Timesharing Option	557	110
SVS8005	TSS Facility	84	22
SVE8019	TSS Administration Option	118	16
SVR8000	Cobol-74 Runtime Facility	86	9
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
SVR8003	TSS Text Processing (TEX) Library Option	36	5
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
SVD8004	TSS Data Basic	139	22
SVE8018	TSS DM-IV Option	91	15
SVD8002	I-D/D/I Facility	1,041	110
SVL8008	Cobol-68 Compiler & Runtime	306	39
SVP8006	MDQS/II Facility	612	117
SVP8007	MDQS/IV Facility	1,058	212
SVS8006	TDS Facility	1,601	210
SVS8007	TPE Facility	561	55
SVD8005	I-D-S/I Data Query Option	167	33
SVV8000	Coexistence IDS/II Facility	*NC	*NC
SVV8001	Coexistence IDS/II DB Converter	*NC	*NC
SVD8003	Indexed Sequential Processing Facility	28	6
SVS8003	DM-IV ITP System Management Facility	1,172	203
SVS8009	DM-IV TP System Management Facility	1,172	203
SVU8003	DM-IV TP Forms Option	220	55
SVS8000	GCOS 8 Operating Sytem EXEC	*NC	*NC
SVP8000	System Maintenance Facility	87	44
SVU8000	Systems Utilities Facility	52	5
SVP8001	Software Management Facility	79	13
SVP8002	System Performance Analysis Facility	281	25
SVC8004	Extended FNP Support Facility	139	28
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
SVE8000	FMS Catalog Cache Facility	69	13
SVE8001	FMS Test Access Mode Facility	70	8
SVE8002	Password Encrypton Facility	58	5
SVU8001	File Generation Facility	49	5

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SOFTWARE PRICES

		Monthly License Fee	Optional Support Service
➤ **GCOS/GCOS 8 SYSTEMS (Continued)**			
SVJ8000	Parametric JCL	36	5
SVE8003	Session Control Facility	306	33
SVE8004	Integrity Control Facility	352	33
SVE8006	Shared Buffer Management Facility	352	33
SVE8007	Native Mode Execution Utilities	176	17
SVE8005	Integrity Control After Journal Option	176	17
SVD8000	DM-IV Standard Facility	1,157	203
SVS8001	Integrated Transaction Processing	1,427	192
SVH8000	Personal Computing Facility	170	30
SVH8001††	PDQ Example Query (EQ)	350	40
SVH8002††	PDQ Interactive Query (IQ)	270	30
SVH8003††	PDQ Comprehensive Report Examination & Display Option (CREDO)	210	25
SVL8013††	COBOL-74 Relational Query (RQ)	90	10
SVC8040†	Interactive Bisync Support-GRTS-II	75	15
SVC8050†	Interactive Bisync Support-NPS	75	15
SVE8030	Software Disk Cache Buffer for DPS 8/20 through 8/49	570	30
SVE8031	Software Disk Cache Buffer for DPS 8/50 through 8/70, DPS Extended	1,045	55
SVE8032	Software Disk Cache Buffer for DPS 88	2,000	100
SVE8038	Console Manager	200	25
SVE8039	Front-end Processor Operator Console	95	5
SVE8040	Console Journal	140	10
CP-6 SYSTEMS			
SFS6120	Control Program-6 (CP-6) Basic System	—	—
SFS6121	Time-sharing. Remote Batch & Multi-Stream Batch Access Modes	1,000	—
SFS6122	Transaction Processing Mode	475	—
SFC6120	Local Front-End Communication Software	90	—
SFC6121	Remote Communications; required with DCS6700	100	—
SFD6120	Interactive Database Processor (IDP)	360	—
SFD6121	I-D-S/II Integrated Data Store/II	850	—
SFL6120	ANS Fortran	300	—
SFL6121	APL	325	—
SFL6122	Basic	300	—
SFL6123	RPG-II	100	—
SFL6124	Cobol	212	—
SFP6120	Assembler	50	—
SFP6121	Text	290	—
SFU6120	Sort Merge	100	—
SFU6121	Forms Processor	150	—
SFX6001	Math Library	—	—
SFU6011	System Aids	—	—
SFL6125	PL/6	195	—
MULTICS SYSTEM			
SGS6300	Multics Operating System	*NSC	—
SGS6801	GCOS (III) Time Sharing Environment	990	—
SGS6802	Transaction Processing Tools	495	—
SGS6803	FAST/DFAST (Fast Access System for Time Sharing)	485	—
SGS6804	GCOS (III) Batch Environment Facility	*NSC	
SGE6800	Multics System Software Extensions	***1,630	—
SGE6802	Remote Job Entry Facility	94	—
SGD6805	Menu Facility	50	—
SGC6800	Multics Communications System (Multics CS)	250	—
SGC6801	Autocall Support Option to Multics CS	110	—
SGC6802	3270 Support Option to Multics CS	220	—
SGC6803	Basic Bisync. Supt. Option—Multics CS	110	—
SGC6804	G115 Support Option to Multics CS	110	—
SGC6805	File Transfer Facility	43	—
SGC6807	Multics HASP Facility (requires Basic Bisync. Support Option SGC6803)	70	—

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MULTICS SYSTEM (Continued)			
SGC6822	X.25 Network Interface Facility	****150	—
SGC6823	Inter Multics File Transfer Facility	****43	—
SGL6801	Fortran Compiler & Runtime Facility	200	—
SGL6802	Basic Compiler & Runtime Facility	407	—
SGL6803	Cobol-74 Compiler & Runtime Facility	240	—
SGL6805	MRPG (Report Generator) Facility	104	—
SGL6806	APL (Version 2)	440	—
SGU6300	Wordpro Comprehensive Facility	935	—
SGU6803	Lister Facility	165	—
SGU6304	Speedtype Facility	110	—
SGU6805	Dictionary Tools	175	—
SGU6820	Compose Facility	475	—
SGD6807	Format Document Facility	40	—
SGU6821	Mergenthaler VIP Device Support Option to Compose	110	—
SGU6833	TED (Text Editor) Facility	319	—
SGU6834	EMACS Text Processing Facility	515	—
SGU6807	Extended Mail Facility	292	—
SGD6806	Executive Mail System (requires Menu Facility SGD6805)	150	—
SGC6824	Forum (Teleconferencing) Facility	****150	—
SGU6801	Sort/Merge Facility	170	—
SGU6835	Offline Page Printing System Support Facility	65	—
SGD6800	MRDS (Multics Relational Data Storage) Facility	660	—
SGD6301	LINUS (Logical Inquiry and Update System) (Requires MRDS SGC6800)	560	—
AGS6801	Time Sharing Library	*****136	—
AGS6802	ISTAT	*****62	—
AGS6803	Graphics Facility	230	—

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