Honeywell DPS 8 Series

MANAGEMENT SUMMARY

Honeywell's new DPS 8 product line offers a full range of processing power, a price/performance curve similar to IBM's 4300 and 303X systems, compatibility with a large variety of peripherals, and operating systems that conform to Honeywell's Distributed Systems Environment. Each system is capable of concurrently supporting batch processing, remote job entry, interactive remote job entry, time sharing, and transaction processing activities.

The virtual memory DPS 8 family, introduced in October 1979, consists of six basic models, the DPS 8/20, DPS 8/44, DPS 8/44D, DPS 8/52, DPS 8/62, and DPS 8/70. The DPS 8/20, 8/44, 8/52, and 8/62 are single processor units, the DPS 8/44D is a dual-processor system, and the DPS 8/70 can have up to four processors. The DPS 8 series uses the new GCOS 8 virtual memory operating system, with increased performance over its predecessor, GCOS. Two special versions of the DPS 8/70, the DPS 8/70C (introduced in June 1980) and DPS 8/70M (introduced in April 1980), use the Xerox-based CP-6 operating system and the Multics operating system, respectively. The DPS 8/70M and 8/70C can have up to six processors each.

The new processors represent price/performance 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 and Level 66 DPS-440 with 2 megabytes memory. The recently announced DPS 8/44D has 70 percent more power than the uniprocessor DPS 8/44, and about the same performance as the IBM 4341-2. The DPS 8/52 has about the same performance as ➢

The six models in the DPS 8 product line offer a wide range of processing power, with particular emphasis on distributed processing. The systems are comparable to the IBM 4331 at the low end and the IBM 3033MP at the high end. The new GCOS 8 virtual memory operating system offers expanded time-sharing, transaction processing, multiprogramming, and multiprocessing capabilities. The systems range in cost from just under $400,000 for a DPS 8/20 to over $5,000,000 for a multiprocessor DPS 8/70.

CHARACTERISTICS

MANUFACTURER: Honeywell Information Systems, 200 Smith Street, Waltham, MA 02154. Telephone (617) 895-6000.

MODELS: DPS 8/20, 8/44, 8/44D, 8/52, 8/62, 8/70, 8/70M, 8/70C.

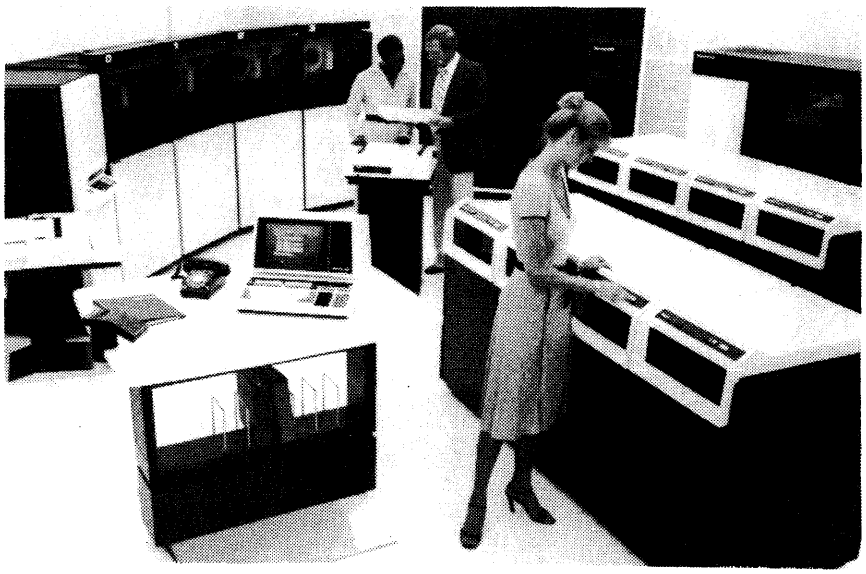
DATE ANNOUNCED: DPS 8/20, 8/44, 8/52, 8/70, October 1979; DPS 8/70M, April 1980; DPS 8/70C, June 1980; DPS 8/44D and DPS 8/62, October 1980.

DATE OF FIRST DELIVERY: DPS 8/20 through 8/70, 2nd quarter 1980; DPS 8/44D, 1st quarter 1981; DPS 8/70M, 2nd quarter 1981; DPS 8/62 and 8/70C, 3rd quarter 1981.

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. ➤



The DPS 8/20 is the smallest in a family of large-scale communications-oriented processors offered by Honeywell. They feature several operating systems, a wide variety of peripherals, and the capability to handle simultaneous batch, RJE, transaction processing, and time-sharing activities.

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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 its maximum four processors is comparable to IBM's 3033MP.

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 and 8/44 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 Level 6 minicomputer, round out the framework of the DSE.

PROCESSORS AND PERIPHERALS

All DPS 8 models use microprocessors with 16K 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 three low end systems, the DPS 8/20, 8/44, and 8/44D, use bit slice microprocessor technology. The larger systems, the DPS 8/52, 8/62, and 8/70, use MSI Schottky TTL logic extensively. 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, which can be field upgraded to the DPS 8/44D. The DPS 8/52 can be field upgraded to the DPS 8/62, which can be field upgraded to the DPS 8/70. Each basic DPS 8 system is equipped with a central processor, except for the DPS 8/44D which is a two-processor system, one System Control Unit (SCU), one Input/Output Module (IOM), and one megabyte of memory. The central processor, SCU, and IOM all operate asynchronously.

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 processors are equipped initially with one SCU. The DPS 8/70 can be expanded to four SCUs.

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 devices and system memory while the processor continues to run its programs.

Memory systems are based on MOS technology, and each processor has a minimum of one megabyte of memory.

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 charcter.

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 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: 6-bit ASCII code is standard.

MAIN STORAGE

STORAGE TYPE: Metallic oxide semiconductor (MOS).

CAPACITY: See table.

CYCLE TIME: See table.

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 exceed specified boundaries. The segment descriptors also contain two bits that override the ring protection scheme by denying 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, and 8/44D, a document handler processor, and separate magnetic tape and unit record processors. The DPS

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	DPS 8/20	DPS 8/44	DPS 8/44D	DPS 8/52	DPS 8/62	DPS 8/70	Basic Level 66/DPS
SYSTEM CONFIGURATION							
No. of central processors	1	1	2	1	1	1 to 4	2
No. of system controllers	1	1	1 to 2	1	1	1 to 4	1
No. of I/O multiplexers	1	1	1 to 2	1	1	1 to 4	1
No. of board slots	19	19	19	35; 36 to 54 opt.	35; 36 to 54 opt.	35; 36 to 54 opt.	35 to 54
No. of network processors	1 to 2	1 to 2	1 to 2	1 to 2	1 to 2	1 to 8	1 to 4
Max. no. of lines	192	192	192	192	192	768	384
DATANET 8	Yes	Yes	Yes	Yes	Yes	Yes	Yes
DATANET 6661	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control unit, ICU or FS*	ICU	ICU	ICU	FS	FS	FS	FS
CENTRAL PROCESSOR							
Relative speed	1.0	1.5	2.6	2.5	3.4	5.7	2.6
No. of instructions	289 + 91 EIS	289 + 91 EIS	289 + 91 EIS	289 + 91 EIS	289 + 91 EIS	289 + 91 EIS	456 + 91 EIS
EIS instruction set	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cache memory	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Size, bytes	2K	2K	2K	2K	2K	8K	8K
Control storage for cache memory							
Type/words per board	RAM/256 words	RAM/256 words	RAM/256 words	RAM/256 words	RAM/256 words	RAM/256 words	RAM/256 words
Word size in bits	36	36	36	36	36	36	36
No. of words	2048	2048	2048	2048	2048	2048	2048
Access time, nanoseconds	30	30	30	30	30	30	30
MOS MAIN MEMORY							
Minimum capacity, 9 bit bytes	1,048,576	1,048,576	1,048,576	1,048,576	1,048,576	1,048,576	1,048,576
Maximum capacity, 9-bit bytes	4,194,304	4,194,304	4,194,304	8,388,608	8,388,608	16,777,216**	4,194,304
Cycle time, nanoseconds	750	750	750	750	750	750	750
Access time, nanoseconds	440	440	440	440	440	440	440
Words fetched per cycle	2	2	2	2	2	2	2
I/O CONTROL (PER IOM)							
Channel data rates, bytes per second	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000
No. of unit record devices	8	8	8	8	8	8	8
No. of disk drives	32	32	32	32	32	32	32
No. of magnetic tape units	16	16	16	16	16	16	16

*ICU is the Integrated Control Unit while FS is the Free-Standing Control Unit.
**Maximum memory with GCOS 8. Maximum with GCOS is 8,388,608 bytes. Maximum with Multics (DPS8/70M) and CP-6 (DPS 8/70C) is 67,108,864 bytes.

The DPS 8/20, DPS 8/44, and DPS 8/44D are expandable to four megabytes of memory, the DPS 8/52 and DPS 8/62 to eight megabytes, and the DPS 8/70 to 16 megabytes. The Multics-based DPS 8/70M and CP-6-based DPS 8/70C can be expanded to 64 megabytes of memory.

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 new 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.

8/20, 8/44, and 8/44D 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 8/52, 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 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

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The DPS 8 systems support all Level 66/DPS freestanding peripheral subsystems. Honeywell also announced several new peripheral subsystems for the DPS 8: 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, DPS 8/44, and DPS 8/44D systems. The new peripheral processors for the three 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 three printers.

Communications with remote terminals, as well as remote hosts, is an important element in Honeywell's Distributed Systems Environment. Two different Front-End Network Processors (FNPs) are available for communications: the DATANET 6661 and the recently announced DATANET 8. 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, 8/44D, 8/52, and 8/62 can accommodate a maximum of two FNPs, and the DPS 8/70 can handle up to eight. The DATANET processors can support synchronous 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, 8/44D, 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. Two special versions of the DPS 8/70, the DPS 8/70C and DPS 8/70M, use the CP-6 and Multics operating systems, respectively.

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 excuting batch program, on-line document handling, 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 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 six basic models as follows: (1) DPS 8/20 is about twice as powerful as an IBM 4331, 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, 50 percent faster than the DPS 8/20, and the DPS 8/20 is field upgradable to the DPS 8/44; (3) DPS 8/44D is about 70 percent more powerful than the DPS 8/44, and the 8/44 is field upgradable to the 8/44D; (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 8/70 versions equipped with either the CP-6 or Multics operating system, the DPS 8/70C and DPS 8/70M, respectively, 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 INP 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 page.

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

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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, and Procedural Language Processor. The 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 Integrated Transaction Processor (ITP) includes software modules that control the information flow between terminal users and the computer. The ITP 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.

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 designed to support public data networks (PDNs), value added networks (VANs), and private networks.

GCOS 8 has two maintenance packages to identify problems and minimize downtime. The Honeywell Error Analysis and Logging System (HEALS) detects problems

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.

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 include 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 three smaller systems, the DPS 8/20, DPS 8/44, and DPS 8/44D, each have 2K bytes of cache storage available, and the larger units, the DPS 8/52, 8/62, and DPS 8/70, each have 32K bytes of cache area. 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.

DPS 8 REGISTERS

	Length (bits)	Quantity
Accumulator	36	1
Quotient	36	1
Accumulator-Quotient	72	1
Exponent	8	1
Index	80	1
Indicator	18	8
Timer	18	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

PROCESSOR MODES: The central processor operates in three modes: master mode, privileged master mode, and slave mode. Master and privileged master modes are reserved for GCOS 8. They allow unrestricted access to all memory, permit initiation of data transfer operations through the IOMs, and permit the setting of control registers. Slave mode is used by GCOS 8 when appropriate, and for the execution of all user programs. Programs executing in slave mode cannot

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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, ALGOL, JOVIAL, 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 8/70M. 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 CP-6 operating system, an upgrade of the Xerox-based CP-V facility, is used on the DPS 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 is available for the DPS 8 systems to handle business, educational, scientific, medical, and financial requirements.

Honeywell announced a new pricing policy for operating systems at the DPS 8's unveiling. Only the GCOS 8 Operating System Executive (OSE) is provided at no additional cost with a DPS 8 system. Other modules of GCOS 8, such as Data Management-IV and the DM-IV Integrated Transaction Processor, are separately licensed. This policy went into effect on October 9, 1979 for all new system orders of either GCOS or GCOS 8 systems. Current licensed users of GCOS on existing systems will continue to receive software support under the previous policies until October 1, 1980.

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: Three different system control centers are available for the DPS 8: the CSU6601, a desk-top arrangement with 120-cps printer and a 12-inch 1920 characters in a matrix of 80 characters per line, 24 lines and keyboard; 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. 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 characaters 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 or Datanet 8 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.

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.

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USER REACTION

Because the DPS 8 has only a few recent installations we felt it inappropriate to report on user feelings at this time. We do feel, however, that since the DPS 8 is an evolutionary product of the Series 60 Level 66 systems, it would be beneficial to briefly examine Level 66 users' opinions. Accordingly, we have compiled the results of Datapro's 1980 annual survey of Level 66 computer users. The results are presented in the chart below.

Thirty-two users responded to Datapro's survey, representing a total of 37 systems and 48 processors. Out of the 32 responses, 29 systems were the Level 66 Model 05 through Model 80, and the remaining 8 were versions of the more recent Level 66/DPS system. The average installed time was three years, and ranged from six months to just over eight years. Over half of the users purchased their systems, with leases over rentals by a factor of about two to one. Most user applications were traditional business, financial, personnel, and educational programs. COBOL was the most widely used programming language, and all users operated under the GCOS operating system.

We called the DP manager of an automotive products manufacturer in the midwest. He uses a Level 66/DPS system for various manufacturing, financial, personnel, and order entry applications. His system is on a direct on-line link-up with several other large systems in the U.S. for parts order entry handling. The present Level 66/DPS was upgraded several times from a Level 66/05 to the present configurations, with no problems encountered, he said. His programs have run equally well on every system. He added that the system works better with an increased workload, and handles multiple operations very smoothly. He is presently evaluating the DPS 8 systems but has no immediate plans to install one.

A large nationwide financial services organization has a number of Honeywell large-scale processors installed in regional centers. We called the DP manager of the firm's northeastern complex. He told us they had just installed their second Level 66/DPS system, giving them a total of seven processors. He was generally pleased with his two systems, and particularly with the GCOS operating system, which he labelled "superb." A DPS 8/70 with three processors is currently on order with GCOS. It will replace the Level 66/DPS presently used for batch processing.

	Excellent	Good	Fair	Poor	1980 WA*	1979 WA*
Ease of operation	12	17	2	1	3.3	3.4
Reliability of Mainframe	21	10	1	0	3.6	3.6
Reliability of Peripherals	7	20	4	1	3.0	3.4
Responsiveness of maintenance service	7	18	5	1	3.0	3.6
Effectiveness of maintenance service	6	18	4	3	2.9	3.1
Technical support:						
Trouble-shooting	4	13	10	5	2.5	—
Education	3	13	8	7	2.4	—
Documentation	3	14	11	4	2.5	—
Operating system	18	8	4	2	3.3	3.9
Compilers and assemblers	13	15	2	2	3.2	3.5

*Weighted Average on a scale of 4.0 for Excellent.

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.

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 IOM's or processors attempt to access the same main storage module.

CONFIGURATION RULES

The DPS 8/20 and DPS 8/44 central systems are packaged within a single cabinet. The DPS 8/20 (CPS8124), DPS 8/44 (CPS8126), and DPS 8/44D (CPS8127) are equipped with one megabyte of main memory, one CPU (two CPUs in the DPS 8/44D), one system control unit (SCU), and one IOM with 19 channel slots. One additional SCU and IOM can be configured on the DPS 8/44D to provide a tandem system with all central system units cross-connected. Memory on all three systems can be increased up to 4 megabytes through a 1 megabyte addition (CMM8001) for a total of 2 megabytes, followed by another 2-megabyte addition (CMM8002). The DPS 8/20 (CPS8124) can be field upgraded to the DPS 8/44 (CPS8126), and the DPS 8/44 can be field upgraded to the DPS 8/44D (CPS8127).

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

All Honeywell level 66/DPS peripherals are supported on the DPS 8/20, DPS 8/44, and DPS 8/44D, in addition to four new peripheral processors introduced exclusively for these systems. The Multifunction Processor (MFP8000) 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 (URP8000) can support up to eight unit record devices. The Magnetic Tape Processor (MTP8000) can support up to eight tape units. The Mass Storage Processor comes in two versions: single-channel (MSP8000) and dual-channel (MSP8001). It can control up to 16 single spindle or 8 dual spindle disk drives in 5 specific configurations:

	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 MSP8001, and only one MFP8000, MTP8000, or URP8000, as these three units are mutually exclusive. With the addition of a second IOM on the DPS 8/44D, additional integrated peripheral processors can be added in the second cabinet. Additional free-standing peripheral processors may be added as desired.

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	Excellent	Good	Fair	Poor	1980 WA*	1979 WA*
Applications programs	0	18	5	4	2.5	2.7
Ease of programming	4	24	3	0	3.0	3.4
Ease of conversion	7	14	8	1	2.9	3.2
Overall satisfaction	7	19	5	0	3.1	3.6

*Weighted Average on a scale of 4.0 for Excellent.

The DPS 8/52, DPS 8/62, and DPS 8/70 each have a free-standing central system. The DPS 8/52 (CPS8183), DPS 8/62 (CPS8184), and DPS 8/70 (CPS8187) have one megabyte of main memory each, one CPU, one IOM with 35 available slots (an option on the DPS 8/70 provides up to 54 slots), and one System Control Unit. Memory on these large processors can be increased in increments of one (CMM8011), two (CMM8012), and four (CMM8013) megabytes on both processors, and also eight megabytes (CMM8014) on the DPS 8/70. Maximum memory capacity for the DPS 8/52, DPS 8/62, and the DPS 8/70 operating with GCOS is eight megabytes, and for the DPS 8/70 operating with GCOS 8 the maximum is 16 megabytes. The DPS 8/70 with Multics and CP-6 can expand to 64 megabytes. The DPS 8/52 can be field upgraded to the 8/62, and the DPS 8/62 can be field upgraded to the DPS 8/70. The DPS 8/52 and DPS 8/62 can support up to two Front-End Network Processors (DCU6661/8010) and two System Consoles (CSU6601, CSU6004, or CSU6005). Additional CPUs, SCUs, IOMs, and tandem systems are not offered for the DPS 8/52 and DPS 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.

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

MASS STORAGE

In addition to the newly introduced single-channel MSP8000 and dual-channel MSP8001 Mass Storage Processors, which were designed for the smaller DPS 8/20, 8/44, and 8/44D systems, the two general-use mass storage processors available for the DPS 8 systems are the MSP0607 and MSP0609. These units handle data transfer functions such as address conversions, formatting, status reporting and collection, transfer routing, test and diagnostic processing seeks, and seek overlapping in addition to automatic I/O command retrys and alternate track processing. The MSP0607 is a single-channel, free-standing unit. The MSP0609 is a dual-channel device, consisting of two freestanding units. The MSP0607 can be configured for up to 16 MSU0400/0402/0451 disk drives or 8 MSU0500/0501 drives, plus several mixed combinations.

MSU0400/0402 MASS STORAGE UNIT: Provides formatted storage for 78 million 9-bit bytes (117 million 6-bit characters) on one Honeywell Type 4451 removable disk pack, whose 12 disks have 19 recording surfaces with 41 tracks, including 7 spares, per surface. There are 40 sectors per track, with 256 nine-bit bytes per sector. Each cylinder is composed of 19 tracks, and there are 411 cylinders per pack. Unformatted storage capacity is 100 million 9-bit bytes (133 million 6-bit characters).

MSU0451 MASS STORAGE UNIT: With twice the capacity of the MSU0402, this unit provides 156 million 9-bit bytes (234 million 6-bit characters) on one Honeywell Type 4451 removable disk pack. The 4451 contains 12 platters with 19 recording surfaces. The drive utilizes "Winchester" technology, employing top and bottom platters for protection. One of the remaining surfaces is used for servo control. Each data surface consists of 815 tracks including spares. Three are 40 sectors per track, with 256 nine-bit bytes per sector. Each cylinder is composed of 19 tracks, and there are 812 cylinders per pack. Unformatted storage capacity is 200 million 9-bit bytes (266 million 6-bit characters).

MSU0500 MASS STORAGE UNIT: This high-capacity unit has a formatted storage capacity of 626 million 9-bit bytes (940 million 6-bit characters) per dual fixed-disk unit. Each of the dual disk units uses a stack of 12 platters with 19 recording surfaces and 1630 tracks, including 14 spares, per recording surface. The top and bottom platter are not used for data. One surface of the remaining 10 platters is used for servo control. There are 40 sectors per track, with 256 nine-bit bytes per sector. Each cylinder is composed of 19 tracks, and there are 16.30 cylinders per pack.

MSU0501 MASS STORAGE UNIT: This drive has about twice the capacity of the MSU0500, with a formatted storage of 1.1 billion 9-bit bytes (1,651 million 6-bit characters) per dual fixed-disk unit. Each disk unit contains 12 platters with 20 recording surfaces and 1,680 tracks per recording surface. Effective transfer rate is 983,000 9-bit bytes per second, and the average rotational delay is 8.3 milliseconds.

INPUT/OUTPUT UNITS

MAGNETIC TAPE UNITS: Honeywell offers a wide range of tape drives for the DPS 8 system. One MTP0610 magnetic tape processor can support up to 8 tape units in a single-channel configuration and up to 16 units if the optional dual/simultaneous configuration is implemented. An optional switched channel feature offers a non-simultaneous data channel for increased connectability to multiple IOMs and for switching the data transfer path of the single or dual simultaneous channel betwen IOMs. The MTP0610 offers dynamic code translation between ASCII and Series 60 6-bit code (MTF1145), between EBCDIC and Series 60 6-bit code (MTF1146), and between EBCDIC and ASCII (MTF1147). Built-in capabilities allow the microprogrammed MTP0610 to operate in both NRZI and PE modes, or PE and GCR modes.

MTU0410/0411/0412 MAGNETIC TAPE UNITS: These are 75-ips tension-arm tape drives. The MTU0410 is available in 3 configurations: 9-track, 800/1600 bpi, 60,000/120,000 bytes/sec.; 7-track, 556/800 bpi, 31,275/45,000 bytes/sec.; and 7-track, 200/556/800 bpi, 11,250/31,275/45,000 bytes/sec. The MTU0411 is available in 2 configurations: 9-track, 800/1600 bpi, 60,000/120,000 bytes/sec.; and 7-track, 556/800 bpi, 31,275/45,000 bytes/sec. The MTU0412 is a dual-drive subsystem consisting of two MSU0411 drives.

MTU0500 MAGNETIC TAPE UNITS: These are vacuum-column 125-ips tape drives. The MTU0500 drives are available in 4 configurations: 9-track, 800/1600 bpi, 100,000/200,000 bytes/sec.; 9-track, 200/556/800/1600 bpi, 25,000/69,500/100,000/200,000 bytes/sec.; 7-track, 556/800 bpi, 52,125/75,000 bytes/sec.; or 7-track, 200/556/800 bpi, 18,750/52,125/75,000 bytes/sec.

MTU0600 MAGNETIC TAPE UNIT: This is a 200-ips tape drive, available in a single configuration: 9-track, 800/1600 bpi, 160,000/320,000 bytes/sec.

MTU0610 MAGNETIC TAPE UNIT: This is a 200-ips tape drive, available in a single configuration: 9-track, 800/1600/6250 bpi, 160,000/320,000/1,250,000 bytes/second.

UNIT RECORD PROCESSORS: The two systems offered are the free-standing URP0600, and the IOM-integral

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URP0602. These two units are in addition to the URP8000 and MFP8000, available only in the three smaller processors. The three versions perform identically and handle card readers, card punches, card reader/punches, and printers. Card devices can operate in four basic reading and punching modes: ASCII, EBCDIC, BCD, or binary. Maximum mixed configurations can include up to four card devices and three printers, with no more than two card readers, two card punches, or two card reader/punches. An all-printer configuration can include eight printers, of which a maximum of five can be PRU1100 printers, two can be PRU1200 printers, and three can be PRU1600 printers.

CRU1050 CARD READER: Reads 80-column punched cards, 51-column punched cards (optionally), or mark-sense cards (optionally). Reading is photoelectric, column by column, at a 1050-cpm rate. The reader has a 3000-card input hopper and a 2500-card output stacker.

CRU0501 CARD READER: Reads 80-column punched cards in the ASCII, BCD, or EBCDIC mode. Reading is via solid-state light emitting and sensing devices (photoelectric) on a column-by-column basis at 500 cpm. The reader has a 1000-card input hopper and a 2500-card output stacker.

CRU0401 COMBINATION CARD READER AND PUNCH: Reads 80-column cards serially be a photoelectric technique at 400 cpm and punches 80-column cards at 100 to 400 cpm, depending on the number of columns punched per card. The input hopper has a capacity of 1200 cards, and the output hopper capacity is 1300 cards.

PCU0121 CARD PUNCH: Punches 80-column cards in Hollerith or binary code at a speed of 100 to 400 cpm, depending upon the number of columns punched in each card. The input hopper has a capacity of 1200 cards, and the output stacker has a 1300-card capacity.

PRU1100 LINE PRINTER: Prints at 1100 lpm using 42 contiguous characters on a print drum with a standard 63-character set. The maximum speed using the full 63-character set is 825 lpm. The PRU1100 has 132 print positions, 10 characters per inch, and prints 6 or 8 lines per inch on continuous forms with up to 6 parts. Forms width is 4.75 to 17.75 inches. Programmed operations include print and space, no space, space only, skip, skip to any of 15 coded positions, vertical line space, and error status reporting.

PRU1200 BELT PRINTER: Prints at 1200 lpm, using a print belt/cartridge with a special 48-character set, and has a burst speed of 1500 lpm with a limited character set. Other character sets of 63, 64, and 94 characaters are optional, including ASCII, EBCDIC, and OCR-A sets. The PRU1200 has a maximum speed of 975 lpm using a 63-character set and 800 lpm with a 94-character set. The standard data format is 136 print positions per line (160 print positions optional), spaced 10 characters per inch, with 6 or 8 lines per inch vertical spacing. the PRU1200 prints on single-part or multipart forms (one original and up to five carbon copies) employing 4 to 22 inch wide paper. The PRU1200 may be field-upgraded to a PRU1600.

PRU1600 BELT PRINTER: Prints at 1600 lpm, using a print belt/cartridge with a 48-character set, and has a burst speed of 1900 lpm with a limited character set. Optional character sets of 63, 64, and 94 characters include ASCII, EBCDIC, and OCR-A sets. The maximum speed of the PRU1600 is 1325 lpm with a 63-character set and 985 lpm with a 94-character set. The standard data format is 136 print positions per line (160 print positions optional), spaced 10 characaters per inch, with 6 or 8 lines per inch vertical spacing. The PRU1600 prints on single-part or multi-part forms (one original and up to five carbon copies).

DOCUMENT HANDLER PROCESSORS: The DHP0700 Document Handler Processor enables the input processing of magnetically and optically encoded documents in the DPS 8 Document Entry Subsystem (DES). The DHP0700 provides for full multiprogramming operating system support and features up to four document handlers concurrently on up to four different prime-entry jobs; it accommodates DHU0800 and DHU1600 document handlers in any combination and permits several handlers to be utilized by one prime-pass program at the same time.

The DHP0701 Document Handler and Communications Processor combines two functions and can process magnetically and optically encoded documents while functioning as a data communications front-end network processor. The DHP0701 is intended for use in applications not requiring the full configuration range of a free-standing DPS 8 Document Entry Subsystem and a free-standing Datanet 6600 Front-End Network Processor.

Each DHP0700/0701 has a 32,768-word memory with a cycle time of 1.0 microsecond per word. Each memory word is composed of 18 bits; however, data words of 6, 9, 18, or 36 bits can be accommodated.

The basic DHP0701 controls the operation of up to two concurrently active document handling units in an unrestricted multiprogramming environment. The DHP0701 accommodates DHU0803, DHU0814, and DHU1600 document handler units. In a single-handler subsystem, any of the three handlers may be configured. In a two-handle subsystem, a DHU1600 in combination with either a DHU0803 or DHU0814 may be configured, or two DHU0803s, two DHU0814s, or a combination of the two may be configured. A general-purchase communications base that provides a data communications function to DHP0701 is optionally available.

DHU0800 SERIES DOCUMENT HANDLERS: Read data from magnetically or optically encoded documents. The DHU0800 is connected to DPS 8 systems through the DHP0700/0701 Document Handler Processor that supports up to four DHU0800 units, each with an operational speed of 830 six-inch documents per minute. The DHU0800 has a minimum of 3 (DHU0803) and a maximum of 14 (DHU0814) pockets and can process documents encoded in ABA E-13B or CMC7 MICR fonts, the OCR-A, OCR-B, 407.-1, 7B, and 12F numeric fonts, OMR 10- or 12-level fonts, and the OCR-A alphanumeric font.

DHU1600 SERIES DOCUMENT HANDLERS: Read MICR documents printed in ABA E-13B MICR font at up to 1625 documents per minute. The DHU1600 is connected to a DPS 8 system through a Document Handler Processor which accommodates up to four DHU1600 units. The standard 4-pocket unit is expandable in 4-pocket modules to a maximum of 32 pockets. The DHU1604 has 4 pockets; the DHU1608, 8 pockets; the DHU1612, 12 pockets; and the DHU1616, 16 pockets.

PAGE PRINTING SUBSYSTEM (PPS-II): Operates on-line, off-line, or remotely under the control of a preprogrammed Level 6 minicomputer using the PPS-II executive. When operating on-line with a DPS 8 the data is transmitted either directly to the PPS-II for printing or stored on disk for later output. In the off-line mode information contained on 7- or 9-track tape is read into the PPS-II for printing. Remote PPD-II units communicate with the host via standard communications lines and function the same as the on-line mode. Optionally, the host computer can write a control block at the beginning of each report to maximize thorughput and minimize operation intervention. Up to three PPS-II systems can be connected to a single host.

Printing is electrostatic. The PPS-II prints both variable data and forms in one pass. It prints the required copies and then

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cuts, collates, and stacks the finished product. Colored toners are available to customize the output and to reduce the need for colored paper. Forms perforation and punching are optional.

An operator console containing a CRT display provides job, system, and device status information. Through the console keyboard, the operator directs system activity and manages the software execution of the diagnostics.

The PPS-II prints at 8000, 12,000, or 18,000 lpm at a line spacing of 10 lines per inch. Four, six, or eight lines per inch are also available. Either 10 or 12.5 characters per inch may be utilized, with 105 or 132 positions per line. The PPS-II optimized font contains 120 upper and lower case characters. Both 2- or 3-hole punching and vertical perforations between columns are available.

COMMUNICATIONS CONTROL

DATANET 6661 FRONT-END NETWORK PROCESSOR (FNP): This processor provides large-volume network communications capabilities for DPS 8 sytems. 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.

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 procesor, when required. The remaining I/O connections are for the Channel Interface Bases, through which the network devices enter the system.

Each system uses a high speed RAM memory subsystem which performs all storage functions without restrictions on address sequences, data patterns, or repetition rates. Memory features include single-and double-word fetch, self-contained initialize and refresh logic, and standard EDAC (error detection and correction) capability. 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.

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 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. The DCU6661 can accommodate up to 12 CIBs.

The Channel Interface Base accepts up to four (except as noted) of the communications channels listed below, in any combination.

Channel Interface, Asynchronous 20 mA Current Loop (DCF6610)—dual channel up to 9600 bps

Channel Interface, Dual Synchronous EIA RS-232-C (DCF6611)—dual channel package up to 9600 bps each

Channel Interface, Dual Asynchronous EIA RS-232-C (DCF6612)—dual channel package up to 9600 bps each

Channel Interface, Auto Call Units (DCF6613)—dual channel Auto Call Units

Channel Interface, Synchronous MIL-STD 188C (DCF-6614)—one channel up to 10,800 bps

Channel Interface, Dual Asynchronous MIL-STD 188C (DCF6615)—dual channel package up to 9600 bps each

Channel Interface, Broad Band MIL-STD 188C (DCF-6616)—one channel up to 72,000 bps

Channel Interface, HDLC MIL-STD 188C (DCF6617)—one channel up to 9600 bps

Channel Interface, Dual Bisynchronous (DCF6618)—dual channel package up to 10,800 bps each

Channel Interface, Broad Band (DCF6619)—one channel up to 72,000 bps

Channel Interface, HDLC Voice Grade (DCF6620)—one channel up to 10,800 bps

Channel Interface, Bisynchronous Broad Band (DCF6621)—single channel up to 72,000 bps

Channel Interface, HDLC Broad Band (CDF6622)*—one channel up to 72,000 bps

Channel Interface HDLC CCITT, V.35 (DCF6623)*— one channel up to 72,000 bps

Channel Interface, Broad Band CCITT, V.35 (DCF6627)—one channel up to 72,000 bps

*This Channel Interface Option requires two (out of the four available) options on the Channel Interface Base.

DATANET 8 FRONT-END NETWORK PROCESSOR (FNP): This new 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 256K bytes of memory (expandable to 512K), a 256K byte diskette (a second 256K diskette is optional) and can accommodate from 16 up to 128 communication lines. The DPS 8 Host connection (DCE8006) and either the 30-PS Console (DCF8008) or the 120-PS Console (DCF8006) are required additions.

The DATANET 8 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 the DATANET 8 and can be field-installed:

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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 or Asynchronous to 20.8K bps.

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 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 the following activities:

Batch processing

Remote job entry (RJE)

Interactive remote job entry (IRJE)

Time-sharing

Transaction processing

Direct program access

On-line document handling

On-line test and diagnostics

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 64 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. As many as 600 time-sharing users can operate simultaneously, and GCOS 8 can use up to 64 megabytes of memory for this activity. 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 working spaces, 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 contiguous in main memory. With memory access, segment descriptors and page table words translate the virtual address to a main memory address.

A program can obtain access only to those segments whose descriptors GCOS 8 previously placed in the program's descriptor segment. A program may have access to other segments via execute-only permission, read-only permission, or read or write access. The segment descriptors and their contents are protected by hardware and set by GCOS 8 when it is executing in the highest level of privilege. Many hardware and software malfunctions are bounded by segment descriptors, to improve system performance and availability.

Shared access is another function provided by descriptor-controlled access. Segments that include fixed data or procedures can be shared by assigning two or more processes read-only or execute-only privileges. This assures controlled availability of all levels of information.

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.

In GCOS 8 batch processing both locally and remotely entered jobs ase assigned one of several user-defined job streams to control job priorities. GCOS 8 monitors the current status of processors, memory, and peripherals. It also assigns system resources to jobs according to their priority, with urgent jobs receiving higher priority.

Remotely entered jobs differ from local jobs only in that the GCOS 8 I/O routines interface with the local front-end network processor instead of a pheripheral subsystem. Once the remote job enters the job stream under GCOS 8 control, processing is the same as for local jobs. Output can be directed to the sending remote terminal, central system files, another terminal, or printed or punched at the central system. The remote user can also converse interactively with the central system via GCOS 8.

GCOS 8 provides a comprehensive time-sharing service that doesn't disrupt other processing operations. All the catalog structuring, source and object library protection, file sharing, and access control capabilities of the file system are available. A time-sharing terminal can interface with the interactive remote job entry facility.

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Transaction processing software such as the Transaction Processing System (TPS) and DM-IV Transaction Processor (DM-IV TP), permits the user to handle business transactions in a timely fashion. Although TPS and DM-IV TP differ somewhat in internal architecture, they both operate under GCOS 8 and cooperate with the GCOS 8 executive to provide management of data bases, transaction resources, terminals, recovery and restart procedures, system privacy, and transaction processing for varied applications with a rapid turnaround time.

Direct program access permits a terminal user direct access to an executing batch program. The terminal appears as an on-line peripheral to the system. Direct access programs can be written in any batch programming language. They can be entered via local or remote batch or time-sharing.

On-line document processing uses up to four document handlers reading data into a document handler processor. This controller is a separate unit providing control and interface into the central system. A buffer stores enough data before off-loading to the central processor, thus freeing up the CPU for normal processing activities.

On-line test and diagnostics permits the operator to verify the operation of various portions of the system to determine if a malfunction actually exists.

Data Management: Facilities include Data Management-IV, which provides a complete range of logical data management capabilities; the Unified File Access System which provides the interface between the logical data management functions and physical devices; and the File Management Supervisor, for cataloging files, allocating file space, and controlling user access.

Data Management-IV (DM-IV) is a set of integrated software products that support concurrent access to common, shared data bases in both conversational and procedural modes. It consists of a Data Manager and an optional Transaction Processor, Query and Reporting Processor, and Procedural Language Processor.

The Unified File Access System (UFAS) is the interface between logical data management and the physical devices. It provides buffer management, blocking and deblocking, record location, error checking, and label processing for sequential, relative, indexed, and integrated files. A dynamic buffer pooling technique reduces the space required for data input and output buffers.

The File Management Supervisor maintains a catalog of all the files in the system, handles the allocation and deallocation of physical file space to logical files, and controls access to the system itself as well as to files.

Several utility programs are available for loading programs, moving data files, media conversion, sorting/merging of data files, editing, and modification of library routines.

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. Another safeguard is a hardware implementation that controls access to sets of file 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 NPS controls five types of remote processing in any combination: remote job entry (RJE), transaction processing, time-sharing, message switching, and direct program access. RJE supports four standard interfaces for remote computers: the 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 Level 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 new set of communication software products based on Honeywell's Distributed Systems Architecture (DSA). DNS supports up to two DPS 8 Host connections enabling one DATANET 8 to serve two hosts.

DNS operates in the DATANET 8 in conjunction with a DPS 8 host running the GCOS 8 operating system to provide support for transaction processing, distributed transaction processing, distributed terminal concentration, time-sharing, remote job entry, direct program access, and host to satellite/satellite to host support for DM-IV Transaction Processing. DNS supports 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, 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 7100/7200/7801/7802, VIP 7700R/7760/7804/7805, and VTS 77XX. Also supported is the Distributed System Satellite (DSS) which is a hardware/software system that allows a 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.

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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, 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 (TAPs) 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.

Within the TDS Executive, there are four major functional components: Transaction Manager, Data Base Manager, Integrity Manager, and Message Manager.

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

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

The TDS System Integrity Manager provides for fast, automatic recovery and restart after any type of application or system failure.

The TDS 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, handles the acceptance and delivery of input and output messages, and interfaces with any DPS 8 Front-End Network Processor running under the Network Processing Supervisor (NPS) or General Remote Terminal Supervisor (GRTS-II).

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. In multiple-processor systems, the time-sharing users' programs can simultaneously use as many processors as desired by the site. The executive also performs various services for the time-sharing programs, including I/O control, file creation, cataloging, storage protection, and resource accounting.

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, Time-Sharing JOVIAL, APL, and Time-Sharing ALGOL. 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.

The Time-Sharing system includes several user aids, including the HELP command to provide a detailed explanation of system error messages; a Command Loader for storing and accessing new subsystems; Command File Processing, a non-interactive processing mode in which user responses to terminal input requests are obtained from a file; and Deferred Processing, in which a predefined input file is used for responses and the resulting dialog is directed to an output file.

LANGUAGES: The language processors available for use on the DPS 8 systems under GCOS 8 are COBOL-74, FORTRAN, PL/1, GMAP, GPSS, BASIC, DataBASIC, SIMSCRIPT, PASCAL, Compiler "B", LISP, ALGOL, APL, JOVIAL, 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. COBOL-74 uses ASCII as the standard internal code set and accommodates package decimal and 16-, 32-, and 36-bit binary standard numeric representations. Additional features include a communications facility that permits development and debugging of programs by remote users, support for the

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Data Manipulation Language specified by the CODASYL Data Base Language Task Group, support for relative and indexed I/O files, and alternative record key addressing for indexed sequential files. Program calls to programs written in other higher-level languages can be recognized and compiled. COBOL-74 will run on a minimum DPS 8 system.

FORTRAN is a full implementation of ANSI FORTRAN IV with extensions. The 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. The FORTRAN processor compiles programs in local, remote job entry, or time-sharing mode and ensures compatibility between source programs developed in one environment and used in another. FORTRAN offers free-form format with or without line numbers. The compiler is also capable of handling argument validation for built-in functions and random file input/output functions. Both ASCII and BCD character sets are supported. An optional enhancement includes the Data Manipulation Language (DML) for support of DM-IV Data Manager-controlled data base files.

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. Both upper case and lower case letters can be used to form names up to 256 characters long. The BCD character set can be utilized through transparency features.

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. Among the facilities included are built-in mathematical functions, a matrix operations package, string manipulations, BCD file input-output, subroutine CALL, and formatted printing and chaining.

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. Time-sharing subsystems include Create, which reserves space for a data base of a size determined by user-supplied parameters; a component that analyzes and reports the percentage of space used in a data base, in detail or in summarized form; and a component that verifies the integrity of a data base, reports the quantities of various entities contained in it, and releases the space occupied by a data base. Batch subsystems include Load, a component that builds a data base from an external input file and/or a file produced by a previous unload operation, and a component that builds a file from an existing data base; the file can be merged with another file in a subsequent load operation.

JOVIAL is a general-purpose, procedure-oriented programming language that is relatively machine-independent. It is fully integrated with the GCOS software and designed to perform optimally in the multidimensional environment. JOVIAL is procedure-oriented and runs under GCOS 8, permitting programs to be developed and executed in time-sharing as well as local and remote batch environments. JOVIAL data formats include integer, fixed-point, floating-point, Boolean status, literal, bit-string, byte-string, characteristics, mantissa, and table entry.

The ALGOL compiler operates under GCOS 8 and permits programs to be compiled and executed in local batch, remote batch, or time-sharing mode. It encompasses the ALGOL-60 language, including recursive processing and dynamic storage allocation. Useful extensions include extended-precision real (floating-point) numbers, an extended integer division operator, debugging aids, segmentation facilities, character-handling capabilities, and a set of input/output functions for both physical and logical records.

APL/66 Level II is a superset version of the APL programming language. APL/66 is an interactive system for use with large-scale Honeywell computers. The language is intended for applications requiring the manipulation of arrays of data as in statistical and management analysis, corporate planning, and operations research. The APL/66 language employs a special character set in which all functional operators are represented by single characters.

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; extended file handling is available; external procedures can be separately compiled and kept in and called from (random) libraries; various nonstandard procedures and functions provide access to many DPS 8 features such as calling other TSS commands.

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. LISP is a time-sharing subsystem which provides interactive execution of LISP programs. It uses "evalquote" as its top-level supervisor, permitting any LISP function to be evaluated immediately.

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. With SIMSCRIPT, portions of a simulated system can be considered individually or in relation to other parts of the system, at the discretion of the user. SIMSCRIPT provides automatic assignment of available storage for maximum utilization of processor storage during execution. A report generator is also part of the SIMSCRIPT package.

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, random, 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. Using transaction and even elements, GPSS produces a simulation employing user-defined specific sequences in which events can occur, units of time required by events, priority levels for transactions (in case of conflicts or blockages), model elements that accommodate only one transaction at a time (such as a lathe, or a data channel), model elements that accommodate multiple simultaneous transaction (such as an elevator or railroad terminal), logic switches for two-state conditions, and maintenance of statistics for system output or for use during processing.

The General Macro Assembler Program (GMAP) enables the programmer to code either in an open-ended macro

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language or directly in machine-oriented symbolic instructions that: translate control and assembly pseudo-operations; recognize and translate addresses and linkage information for externally defined symbols; produce a binary program; allow for programmer-defined macro instructions at assembly time; provide for accepting compressed symbolic decks plus any desired alter cards as input, and producing an updated compressed deck as output; and provide for a complete listing of the assembled program, plus a symbol reference table as output.

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, TOTAL Central, and Shared Mass Storage.

Data Management-IV (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 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 to the access process.

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

TOTAL Central is a widely used proprietary data base management system that uses data set relationships to establish a network structure among records in different data files in an integrated and nonredundant manner. TOTAL Central's network structure provides the ability to directly interrelate a data record with up to 2500 other data record types in the data base.

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The TOTAL Central system design supports data dependence; only the data elements used by a program need be described for that program. New data elements and records may be added to the data base without affecting existing programs. The TOTAL system is described in detail in Report 70E-132-01.

The Shared Mass Storage (SMS) 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.

HEALS II: The Honeywell Error Analysis and Logging 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 procesor 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. An 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 of on-line preventative and corrective maintenance 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 trouble-shooting programs.

MULTICS SOFTWARE

The DPS 8/70M computer system uses Honeywell's Multics operating system. Multics is a specially designed virtual memory operating system that offers remote terminal access as the primary means of entering the system, multiprocessing with dynamic reconfiguration capabilities, and a unique hardware-based ring structure that provides security for sharing of programs and data. It also has a tree-structured hierarchy for organization of user and system storage, and the availability of multiple programming environments and user interfaces within a single system. It accommodates batch and time-sharing applications, similar to GCOS 8, 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 hardware, so that only the currently accessed pages of a segment are required in main memory.

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

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

Users communicate with the system through a command processor, which interprets user requests and invokes the appropriate software component to perform the function, eliminating the need for users to deal with traditional job and control language. User modifications in the command processor can define restrictions to use of the system for specified users.

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 8/70M 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, automatic recovery and restart, and data security maintenance.

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

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. The facility operates in conjunction with WORDPRO.

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

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The DPS 8/70C computer system uses the CP-6 operating system, a recent Honeywell enhancement of the Xerox-developed CP-5 operating system used on certain Honeywell Level 66/DPS systems and on the larger Xerox processors. CP-6 includes facilities for interactive time-sharing, on-line transaction processing, multiprogrammed local and remote batch processing, and distributed, sensor-based real-time processing. Up to 500 time-sharing users can use CP-6 concurrently for activities which include program development, compilation, execution, and debugging; file maintenance; and text creation and editing. Under CP-6 transaction processing, terminal screen formatting and data field editing is performed in the communications processor closest to the terminals in the CP-6 network. Other transaction processing features include common or separate, media-independent journals; automatic recovery and restart; and processing concurrency.

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 128,000 words. CP-6 also provides three-level protection for user context segments and hardware management.

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.

APPLICATION PROGRAMS AND UTILITIES

Honeywell offers the following utility routines and application programs for the DPS 8 systems.

Utilities

- HONEYEDIT
- TEXT Editor
- Text Executive Processor (TEX)
- Slave Program Activity Monitor (SPM)
- Time-sharing Debug/Trace (TSD/T)
- Collection and Plot of System Usage Levels (CAPSUL)
- Data Dictionary IDS I
- Mass Storage Utility
- Tape Testing
- Peripherals Resource Monitor
- Time Sharing Dump Analysis
- Load Generator System-II
- SOLOMAN (Source & Library On-Line Manager)

Banking Applications

- Check Handling Executive Control Systems (CHECS)
- Document Entry Subsystem
- Proof and Transit Subsystem
- FUNDS System Administrative and Control Module
- FUNDS System Customer Profile Module
- FUNDS System Savings Account Module
- FUNDS System Loan Account Module
- FUNDS System General Ledger Module

Manufacturing Applications

- Honeywell Manufacturing System (HMS)
- Inventory Record Mangement Module
- Manufacturing Data Control Module
- Material Requirements Planning Module
- Master Production Scheduling Module
- Statistical Forecasting Module
- Capacity Requirements Planning Module
- Automatically Programmed Tools (APT)

Distribution Applications

- PROFIT (Inventory Control)
- Point of Sale System

Management Science Application Programs

- Mathematical Programming System (MPS)
- BMDP Statistical Programs
- SPSS Statistical Package
- IMSL Math/Statistics Library
- Project Management and Control System (PMCS)
- GPSS Simulation System
- Numerically Integrated Elements for Systems Analysis—(NISA) (Structural Analysis)
- Polo Finite (Structural Analysis)
- Coordinate Geometry (COGO)
- Concordance Generator Program

Financial Applications

- General Ledger
- Accounts Payable
- Accounts Receivable
- Payroll

Miscellaneous Application Programs

- Individualized Mathematics Instruction/66 (IMS/66)
- SCRIBE/66 Scheduling System
- HCSS/66 (Hospital Computer Sharing System)
- ROLIN (Rapid On-Line Information Network)
- Employment Security Application Packages

Education Support

- Large Systems Marketing Education Support

PRICING

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

TYPICAL MODEL DPS 8/20 SYSTEM: Consists of a CPS8124 central processor with one megabyte 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, one MSU0451 disk drive (200 megabytes), one MFP8000 integrated multifunction processor, and one PRU1100 line printer (1100 lpm). Purchase price is approximately $345,461, monthly maintenance is $1,283, and the three-year lease price per month is $9,835.

TYPICAL MODEL DPS 8/52 SYSTEM: Consists of a CPS8183 central processor with four megabytes of memory, IOM with 35 slots, and one SCU, a CSU6601 system console, one MSP0607 mass storage processor with four MSU0500 disk drives (2,500 megabytes), one MTP0610 magnetic tape processor with two MTU0610 dual-density tape drives, one URP0600 unit record processor with two PRU1200 line printers (1200 lpm), one CRU1050 card reader (1050 cpm), and a PCU0300 card punch (300 cpm). Purchase price is approximately $1,248,851, monthly maintenance is $4,828, and the three-year lease price per month is $35,034.

TYPICAL MODEL DPS 8/70 SYSTEM: Consists of a single-processor CPS8187 with eight megabytes of memory, one IOM with 35 slots, one SCU, one CSU6601 console and one CSU6602 auxiliary console, each with 120-cps printer, one dual-channel MSP0609 mass storage processor with

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eight MSU0501 disk drives (8,800 megabytes), one MTP0610 tape processor with four dual-density MTU0610 tape drives, one URP0600 unit record processor with two PRU1600 line printers (1600 lpm) and two CCU0401 card reader/punch units (100-400 cpm), and one DCP6661 front-end network processor. Purchase price is approximately $2,514,914, monthly maintenance is $8,655, and the three-year lease price per month is $73,334.

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 (4 hr. min.)
Principal or senior technical consultant	98
Project supervisor or technical consultant	80
Technical specialist	72
Systems analyst/senior programmer	60
Programmer	42

Monthly charges are 140 times the hourly rates. These 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, and self-instruction. Prices vary from $90 to $1,400 for all services except self-instruction. All self-instruction material except the self-instruction laboratory program can be purchased, while some can be rented. Fees for purchase of this material vary from $11.00 to $1,696. Rental prices, when available, vary from $30 to $100. Self-instruction laboratory program courses are available at $40 to $165 per student.

CONTRACT TERMS: DPS 8 equipment 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 $45 per man-hour.

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. ■

EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	1-Year Lease*	3-Year Lease*	5-Year Lease*
PROCESSORS						
CPS8124	DPS 8/20 Central System; single cabinet, one megabyte memory	$171,405	$ 400	$ 5,131	$ 4,664	$ 4,431
CPS8126	DPS 8/44 Central System; single cabinet, one megabyte memory	259,325	476	7,293	6,630	6,298
CPS8127	DPS 8/44D Dual Processor Central System; two cabinets, one megabyte memory	424,000	1,000	12,145	11,050	10,520
CPS8183	DPS 8/52 Central System; freestanding, one megabyte memory	640,310	1,987	18,046	16,406	15,624
CPS8184	DPS 8/62 Central System; freestanding, one megabyte memory	759,135	2,211	24,279	22,071	20,816
CPS8187	DPS 8/70 Central System; freestanding, one megabyte memory	1,156,399	3,664	36,984	33,621	31,710
CPU8187	Additional central processor for CAS8187; maximum of three	892,232	2,724	29,438	25,807	24,363
CPS8177	DPS 8/70C Control System; freestanding, one megabyte memory	1,571,461	6,305	—	—	47,002
CPU8177	Additional central processor for CPS8177, maximum of three	981,450	3,271	—	—	29,134
CPS8197	DPS 8/70M Central System; freestanding, one megabyte memory	1,300,000	5,144	47,481	—	39,400
CPU8197	Additional central processor for CPS8197, maximum of three	981,450	3,271	35,234	—	29,134
PROCESSOR OPTIONS						
MXC8001	Additional Freestanding System Control Unit (SCU) for CPS 8187; maximum of three; includes all necessary addressing; supports up to 4096K words with GCOS 8, 2048K words with GCOS	57,788	110	1,593	1,545	1,435
MXK8000	System Control Unit Five-Port Expansion Kit for CPS8124 or CAS8126 only; factory installation only	21,669	40	536	519	494
MXC8000	Additional System Control Unit for CPS8127	27,050	50	761	692	675
MXU8000	Additional Input/Output Multiplexer for CPS8127	81,380	192	1,952	1,815	1,682
CPK8127	System upgrade from DPS 8/44 to DPS 8/44D	143,006	40	4,316	3,911	3,728
CPK8162	System upgrade from DPS 8/52 to DPS 8/62	118,825	224	6,233	5,665	5,192
CPK8170	System upgrade from DPS 8/62 to DPS 8/70	397,264	1,453	12,705	11,550	10,984
MXU6002	Freestanding IOM with 35 Channel Function Slots; includes one SCU port and one IOM port	175,055	304	3,862	3,749	3,476

*Includes equipment maintenance.

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EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	1-Year Lease*	3-Year Lease*	5-Year Lease*
PROCESSOR OPTIONS (Continued)						
MXF6005	IOM Expansion from 35 to 54 Channel Function Slots (Freestanding IOM)	53,855	103	1,212	1,189	1,152
CSU6601	System Console; includes keyboard and 120 cps printer	10,390	90	401	345	328
CSU6602	Auxiliary Console; includes keyboard and 120 cps printer	7,728	66	272	248	235
CSF6602	Auxiliary Keyboard/Display Attachment Feature	3,596	30	141	128	121
CSF6603	Additional Keyboard Display; 12 inches; prerequisite is CSF6602	3,082	30	158	143	109
CSF6604	Large Screen Monitor, 23 inches, and Monitor Drive Option; includes up to 50 feet of cable	2,358	15	147	132	126
CSF6605	Ceiling Mount for Large Screen Monitor	194	NC	NA	NA	NA
CSF6606	Extended Systems 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	21	20	19
MGS6601	Motor Generator and Control Unit; 31.3 KVA, 60 Hz, 208/440 VAC input	17,750	56	364	352	324
MGS6002	Motor Generator and Control Unit; 62.6 KVA, 60 Hz, 440/480 VAC input	21,000	68	437	423	391
MGS6003	Motor Generator and Control Unit; 62.6 KVA, 50 Hz, 380 VAC input	22,150	70	460	448	408
MGS6004	Motor Generator and Control Unit; 62.6 KVA, 60 Hz, 208 VAC input	21,000	68	437	423	391
MEMORY						
CMM8001	Additional one megabyte memory for CPS8124/8126/8127	17,250	21	530	481	439
CMM8002	Additional two megabytes of memory for CPS8124/8126/8127; CMM8001 is a prerequisite	34,500	42	1,060	962	878
CMM8011	Additional one megabyte of memory for CPS8183/8177/8187/8197 only	50,000	60	1,452	1,320	1,254
CMM8012	Additional two megabytes of memory for CPS8183/8177/8187/8197 only; CMM8011 is a prerequisite	100,000	120	2,904	2,640	2,508
CMM8013	Additional two megabytes of memory for CPS8183/8177/8187/8197 only; CMM8011 is a prerequisite	200,000	240	5,808	5,280	5,016
CMM8014	Additional eight megabytes of memory for CPS8177/8187/8197 only; CMM8013 is a prerequisite	400,000	480	11,616	10,560	10,032
CMM8015	Additional 16 megabytes of memory for CPS8177/8197 only; CMM8014 is a prerequisite	800,000	960	23,232	21,120	20,064
CMM8016	Additional 32 megabyte of memory for CPS8177/8197 only; CMM8015 is a prerequisite	1,600,000	1,920	46,464	42,240	40,128
PERIPHERAL PROCESSORS						
MSP8000	Integrated Single Cabinet Mass Storage Processor for CPS8124/8126/8127 systems only	39,000	108	1,275	1,164	1,053
MSP8001	Dual Channel Mass Storage Processor for CPS8124/8126/8127	62,500	168	2,039	1,862	1,683
MSF8000	Device Adapter for MSU0400/402/451 on MSP8000 only	3,500	NC	128	118	107
MSA8000	Addressing capability for four MSU0400/0402/0451 for MSP8000 only	4,100	16	187	171	161
MSA8001	Addressing capability for two MSU0500/0501 for MSP8000 only	6,000	16	195	181	161
MSK8000	Upgrade Kit, MSP8000 to an MSP8001	23,500	60	763	697	629
MSF8001	Device Adapter for attachment of up to sixteen MSU0400/0402/0451 for MSP8001 only	6,000	NC	246	225	214
MSA8002	Addressing capability for four MSU0400/0402/0451 for MSP8001 only	4,100	18	198	182	171
MSA8003	Addressing capability for two MSU0500/0501; for MSP8001 only	6,300	18	206	192	171
MSF8002	Non-Simultaneous (switched) Datanet Channel for MSP8000/8001	7,920	15	252	236	216
MSF8003	Non-Simultaneous (switched) IOM channel for MSP8000/8001	7,920	15	252	236	216
MFP8000	Integrated Multi-Function Processor for Magnetic Tape/Unit Record for CPS8124/CPS8126/CPS8127 only; supports 8 magnetic tape units, 4 punched card/printer devices	35,378	149	1,188	1,080	1,007
MTP8000	Integrated Magnetic Tape Processor for CPS8124/CPS8126/CPS8127 only; single channel, 8 magnetic tape unit limit; cannot be used with URP8000 or MFP8000	27,510	137	876	786	756
URP8000	Integrated Unit Record Processor for CPS8124/CPS8126/CPS8127 only; supports 8 UR devices; cannot be used with MTP8000 or MFP8000	26,250	29	792	720	665
MSP0607	Free Standing Single Channel Mass Storage Processor	44,000	123	1,440	1,314	1,190
MSP0609	Dual Channel Mass Storage Processor; two freestanding modules	62,500	168	2,039	1,862	1,683
MASS STORAGE						
MSU0400	Removable-Disk Mass Storage Unit, 100M bytes	16,500	122	647	607	548
MSU0402	Removable-Disk Mass Storage Unit, 100M bytes	20,805	113	703	642	612
MSU0451	Disk Mass Storage Unit, 200M bytes; requires MXF6002 IOM data rate expansion and includes rotational position sensing	27,047	113	922	861	768
MXF6002	IOM Data Rate Expansion Unit	23,720	45	580	561	516
MSK4025	Upgrade Kit from MSU0402 to MSU0451	6,242	—	273	249	236
MSF0006	Dual Access Feature for MSU0402/0451	2,070	13	70	64	61
MSF0007	Remote Position Sensing Option for MSU0402/0451	2,025	13	69	63	61
MSF1023	Device Adapter for MSU0402/MSU0451	11,475	32	342	312	276
MSU0500	Dual Fixed Disk Mass Storage Unit, 940 million characters; includes disk and RPS	37,000	172	1,279	1,195	1,069
MSU0501	Dual Spindle Fixed Disk Drive; 1.1 billion bytes	49,650	197	1,683	1,570	1,401
MSK0501	Upgrade Kit; MSU0500 to MSU0501	12,650	25	350	316	301
MSF0011	Dual Access Feature for MSU0500	4,140	23	146	137	123
MSF1024	Device Adapter for MSU0500	20,000	30	607	551	524
MSF1034	Drive Expansion for MSU0500; required for more than 8 MSU0500's	12,690	14	335	—	308
MSF1037	Device Adapter for MSU0500	—	—	—	—	—

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EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	1-Year Lease*	3-Year Lease*	5-Year Lease*
MAGNETIC TAPE EQUIPMENT						
MTP0610	Magnetic Tape Processor; DPS 8 (1x8); includes IOM channel; for MTU0400/0411/0412/0500/0610	29,400	147	997	906	860
MTU0410	Magnetic Tape Unit (75 ips)	12,410	89	416	400	389
MTU0411	Additional Magnetic Tape Unit for MTU0412 (75 ips)	11,473	112	386	352	336
MTU0412	Magnetic Tape Unit, Cluster of Two (75 ips)	22,946	226	772	705	672
MTU0500	Magnetic Tape Unit (125 ips)	17,441	91	591	565	513
MTU0610	Magnetic Tape Unit (200 ips)	21,000	105	636	578	549
Features for the MTU0410:						
MTF0111	Nine-track, 1600 bpi	3,060	21	94	—	81
MTF0112	Nine-track, 800/1600 bpi	3,940	41	149	137	130
MTF0113	Seven-track, 200/556/800 bpi	6,000	66	251	236	215
MTF0115	Seven-track, 200/556 bpi	3,060	21	94	—	81
Features for the MTU0411/0412:						
MTF0117	Nine-track, 800/1600 bpi	1,685	6	54	49	45
MTF0118	Seven-track, 556/800 bpi	1,685	6	54	49	45
Features for the MTU0500:						
MTF0011	Nine-track, 1600 bpi	3,060	21	94	—	81
MTF0012	Nine-track, 800/1600 bpi	4,137	39	145	133	127
MTF0013	Seven-track, 200/556/800 bpi, NRZI	6,300	63	251	237	215
MTF0015	Seven-track, 200/556 bpi	3,060	21	94	—	81
MTF0016	Seven-track, 556/800 bpi, NRZI	3,213	23	115	105	99
MTF0017	Nine-track, 200/556/800/1600 bpi	6,300	63	251	237	215
Features for the MTU0610:						
MTF0612	9-Track 800/1600-bpi Density	3,940	43	133	123	117
MTF0618	Cartridge Load (factory-installed)	700	2	21	20	19
MTF0607	Speed Density Feature; 20 ips, 800/1600 bpi	6,090	38	269	246	230
MTA1142	Magnetic Tape Addressing for MTU0400/0410/0500/0600 and MTU0610; addresses four devices; one or two required for each MTP0610/MTF1141/MFP8000/MTP8000	221	NC	6	6	5
MTF1115	Series 2000 to Level 66 tape compatibility Feature; one required for each MTP0610/MTF1141/MFP8000/MTP8000	2,410	5	72	66	62
MTF1145	ASCII Code Translator; one required for each MTP0610/MTF1141/MFP8000/MTP8000	945	NC	32	29	28
MTF1146	EBCDIC Code Translator; one required for each MTP0610/MTF1141/MFP8000/MTP8000	945	NC	32	29	28
MTF1147	EBCDIC/ASCII Code Translator; one required for each MTP0610/MTF1141/MFP8000/MTP8000	945	NC	32	29	28
MTF1148	7-Track, 556/8000 bpi capability; one required for each MTP0610/MTF1141/MFP8000/MTP8000; prerequisite MTF1149	1,827	3	57	53	47
MTF1149	9-Track NRZI, 800 bpi capability; one required for each MTP0610/MTF1141/MFP8000/MTP8000	536	14	90	82	78
MTF1150	9-Track GCR, 6250 bpi capability; one required for each MTP0610/MTF1141/MFP8000/MTP8000	11,666	21	282	256	243
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	26	25	24
URA0050	Addressing capability for PCU0120/0121 and CCU0401; one required for each device	4,253	4	131	121	107
URA0052	Addressing capability for CRU1050; one required for each device	7,569	37	241	236	220
URA0053	Addressing capability for PRU1100; one required for each device	1,701	13	54	52	51
URA0054	Addressing capability for PRU1200; one required for each device	7,167	18	228	208	191
URA0055	Addressing capability for PRU1600; one required for each device	7,167	18	228	208	191
URA0056	Addressing capability for CRU0501; one required for each device	231	NC	6	6	5
UNIT RECORD PROCESSORS & FEATURES						
URP0600	Unit Record Processor, free-standing; includes basic 4-port adapter and IOM channel	26,585	40	795	775	684
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	646	627	553
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	26	25	24
URF0041	Dual Switched Channel; includes IOM channel; maximum of one	8,898	15	244	225	212
LINE PRINTERS						
PRU1100	Printer (1100 lpm)	36,820	365	1,217	1,108	1,054
PRU1200	Printer (1200 lpm)	44,420	386	1,698	1,548	1,463
PRU1600	Printer (1600 lpm)	64,940	538	2,482	2,334	2,112
PRF0022	24 Additional Print Positions for PRU1200 or PRU1600	2,610	15	93	87	78
PRK1216	Retrofit Kit Upgrade for PRU1200 to PRU1600	20,520	152	784	786	649
PUNCHED CARD EQUIPMENT						
CRU0501	Card Reader (500 cpm)	16,643	90	507	460	438
CRU1050	Card Reader (1050 cpm)	24,318	161	825	740	709

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EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	1-Year Lease*	3-Year Lease*	5-Year Lease*
PUNCHED CARD EQUIPMENT (Continued)						
PCU0121	Card Punch (100-400 cpm)	18,344	101	648	588	545
PCU0300	Card Punch (300 cpm); not available on 66/85	37,128	344	1,410	1,310	1,212
CCU0401	Card Reader/Punch (100-400 cpm)	27,101	150	799	782	758
CRF0003	51-Column Read Feature (80-col.) for CRU1050	2,079	5	67	62	55
CRF0005	Mark Sense Option for CRU1050	7,416	40	198	—	171
CCK0401	Retrofit Kit; upgrades PCU0121 to PCU0401	8,757	60	151	194	198
URA0050	Addressing capability for PCU0121 and PCU0401	4,253	4	131	121	107
URA0052	Addressing capability for CRU1050	7,569	37	241	236	220
DOCUMENT HANDLER SUBSYSTEMS						
DHP0700	Document handler processor for DHU0800/DHU1600 Series; includes IOM	116,000	370	2,980	2,886	2,670
DHP0701	Document handler processor for DHU0803/0814 and DHU1600 Series; includes IOM channel	58,600	179	1,589	1,451	1,379
DHU0803	Document reader/sorter; 3 pockets; 830 dpm	31,000	289	859	840	816
DHU0814	Document reader/sorter; 14 pockets; 830 dpm	48,920	382	1,979	1,853	1,671
DHU1604	Document reader/sorter; 4 pockets; 1625 dpm	51,060	518	1,519	1,462	1,337
DHU1608	Document reader/sorter; 8 pockets; 1625 dpm	66,240	649	1,893	1,829	1,668
DHU1612	Document reader/sorter; 12 pockets; 1625 dpm	81,420	777	2,279	2,189	2,007
DHU1616	Document reader/sorter; 16 pockets; 1625 dpm	96,600	907	2,660	2,557	2,339
DHA6002	Addressing for second DHU0803 or DHU0814 document reader/sorter	8,900	28	242	221	210
DHF6001	Document handler channel for DHU1600 document reader/sorter	4,800	6	125	122	112
DHF6003	Document handler channel for DHU0800	4,800	6	125	122	112
DHF6004	Document handler control console channel and adapter	6,160	67	179	168	155
DATANET 6661 FRONT-END NETWORK PROCESSOR						
DCU6661	Processor; includes 64K bytes of memory, system support controller, direct interface adapter; up to 12 channel interface bases	48,005	261	1,722	1,611	1,444
OPTIONS FOR DATANET 6661 PROCESSOR						
DCF6609	Channel Interface Base; accommodates all channel types except HDLC	1,501	8	45	44	42
DCF6611	Dual Synchronous Channel Package, EIA-RS232C	1,450	7	43	42	39
DCF6612	Dual Asynchronous Channel Package, EIA-RS-232C	590	4	19	19	18
DCF6613	Automatic Call Unit, Dual Channel	1,180	4	33	32	31
DCF6614	MIL STD 188C Synchronous Channel	1,501	8	45	44	42
DCF6618	Dual Binary Sychronous Channel Package	1,450	7	43	42	39
DCF6619	Broadband Channel	3,056	12	86	85	80
DCF6620	HDLC Voice-Grade Channel	2,573	11	74	72	69
DCF6621	Bisynchronous Broadband Channel	3,056	12	86	85	80
DCF6624	Direct Connect Capability, asynchronous	350	1	9	9	8
DCF6625	Direct Connect Capability, synchronous	480	1	14	13	12
DCF6627	Broadband Channel, CCITT V.35 to 50,000 bps	3,430	12	96	93	88
DCF6927	Universal Modem Bypass, Synchronous to Asynchronous; to 20.8K bps	415	11	26	26	21
DCF6607	Channel Interface Base	1,651	9	53	51	47
DCF6610	20mA Current Loop-Dual Channel Package	1,180	4	33	32	31
DCF6615	MIL-STD 188C Asynchronous Dual Channel	1,501	8	45	44	42
DCF6616	MIL-STD 188C Broadband Channel	1,501	8	45	44	42
DCF6617	MIL-STD 188C HDLC Channel	2,573	11	74	72	69
DCF6622	HDLC Broadband Channel	3,056	12	86	85	80
DCF6623	HDLC Channel, CCITT-V.35	3,430	12	96	93	88
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	961	895	796
OPTIONS FOR DATANET 8 PROCESSOR						
DCM8004	Additional 256K bytes of memory	7,000	70	269	253	230
DCE8003	Processor Power Module Enhancement	20,200	110	685	639	570
DCE8002	Communications Line Expansion from 16 to 64 lines	3,000	5	90	84	73
DCE8004	Communications Line Expansion from 64 to 128 lines; requires DCE8002/8003	5,000	10	152	141	124
DCE8005	Additional 256K diskette unit	1,785	18	69	65	59
DCE8006	DPS 8 Host Connection; maximum of two	8,000	65	293	275	247
DCF8007	Channel Interface Base; maximum of 16	2,500	14	85	80	71
DCF8008	30 cps console for DCU8010	2,520	54	126	120	111
DCF8006	120 cps console for DCU8010	2,888	92	174	168	158
DCF8011	Dual Synchronous Channel; EIA RS-232-C; to 9600 bps	1,500	8	51	47	42
DCF8012	Dual Asynchronous Channel; EIA RS-232-C; to 960 bps	1,000	5	33	31	28
DCF8020	HDLC EIA RS-232-C Channel; to 9600 bps	1,500	8	51	47	42
DCF8022	HDLC Wideband Channel; to 56K bps	3,000	16	101	95	84
DCF8023	HDLC Wideband Channel; CCITT V.35; to 56K bps	3,000	16	101	95	84
DCF8024	Direct Connect Capability, asynchronous or synchronous; to 9600 bps	350	1	12	11	10
DCF8026	Universal Modem By-Pass, asynchronous or synchronous; to 20.8K bps	415	2	14	13	11

*Includes equipment maintenance.

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Honeywell DPS 8 Series

SOFTWARE PRICES

		Monthly License Fee	Optional Support Service
SVC8005	ITP Gateway Option	NC*	NC*
SVD8001	DM-IV FORTRAN Subschema Translator Option	105	11
SVS8002	DM-IV TP Facility	1061	186
SVP8003	DM-IV QRP Option	330	66
SVP8004	DM-IV PLP Option	231	50
SVS8003	DM-IV TP Comprehensive Facility	220	429
SVS8004	DM-IV ITP Comprehensive Facility	2,266	434
SVL8000	COBOL-74 Compiler & Runtime Facility	207	26
SVL8001	FORTRAN Compiler & Runtime Facility	280	50
SVR8001	FORTRAN Runtime Facility	96	16
SVL8002	PL/1 Compiler & Runtime Facility	225	50
SVR8002	PL/1 Runtime Facility	61	11
SVP8005	Debug Support System	44	6
SVL8003	RPG-II Facility	100	5
SVU8002	Sort/Merge Facility	93	17
SVC8006	Host File Transceiver Facility for L6	11	6
SVL8004	Host Resident Program Development Facility for L6	352	88
SVL8005	Host Resident Advanced FORTRAN Facility for L6	187	46
SVL8006	Host Resident COBOL Facility for L6	187	46
SVE8020	Multicopy Timesharing Option	440	110
SVS8005	TSS Facility	66	22
SVE8019	TSS Administration Option	94	16
SVR8000	COBOL-74 Runtime Facility	68	9
SVE8008	TSS File Management Option	88	11
SVE8009	TSS Advanced Application Support Option	132	33
SVE8010	TSS Media Input Option	44	11
SVL8007	TSS BASIC Language Option	160	38
SVE8011	TSS COBOL-74 Option	44	11
SVE8012	TSS FORTRAN Option	44	11
SVE8013	TSS Text Processing Option (TEX)	253	66
SVR8003	TSS Text Processing (TEX) Library Option	28	5
SVE8014	TSS Editing Option (EDIT)	88	22
SVE8015	TSS Document Formatting Option	44	11
SVE8016	TSS Electronic Mail Option	132	33
SVE8017	TSS Sort Interface Option	61	11
SVD8004	TSS Data BASIC	110	22
SVE8018	TSS DM-IV Option	72	15
SVD8002	I-D-D/I Facility	715	110
SVL8008	COBOL-88 Compiler & Runtime	242	39
SVP8006	MDQS/II Facility	484	117
SVP8007	MDQS/IV Facility	836	212
SVS8006	TDS Facility	1,100	210
SVS8007	TPE Facility	385	55
SVD8005	I-D-S/I Data Query Option	132	33
SVV8000	Coexistence IDS/II Facility	NC*	NC*
SVV8001	Coexistent IDS/II DB Converter	NC*	NC*
SVD8003	Indexed Sequential Processing Facility	22	6
SVS8008	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 System EXEC	NC*	NC**
SVP8000	System Maintenance Facility	66	44
SVU8000	System Utilities Facility	39	5
SVP8001	Software Management Facility	60	13
SVP8002	System Performance Analysis Facility	193	27
SVC8004	Extended FNP Support Facility	110	28
SVC8000	GRTS-II Facility	187	44
SVC8001	GRTS-II HDLC Support Option	88	11
SVC8002	NPS Facility	770	209
SVC8003	NPS HDLC Support Option	88	11
SVE8000	FMS Catalog Cache Facility	60	13
SVE8001	FMS Test Access Mode Facility	55	8
SVE8002	Password Encryption Facility	50	5
SVU8001	File Generation Facility	39	5
SVJ8000	Parametric JCL	28	5
SVE8003	Session Control Facility	242	33
SVE8004	Integrity Control Facility	242	33
SVE8006	Shared Buffer Management Facility	242	33
SVE8007	Native Mode Execution Utilities	121	17
SVE8005	Integrity Control After Journal Option	121	17
SVD8000	DM-IV Standard Facility	809	203
SVS8001	Integrated Transaction Processing	1,128	192

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