Honeywell Bull DPS 7000 Series

MANAGEMENT SUMMARY

Shortly after the inception of Honeywell Bull Inc. in March 1987, this new corporate entity unleashed an announcement blitz that began with the introduction of the new DPS 7000 Series of medium-scale mainframes that replace the DPS 7/E Series. The company then announced DPS 8000 mainframes to replace the DPS 8 Series as well as new models of the DPS 6 PLUS minicomputer line. Without breaking stride, Honeywell Bull also announced new versions of its GCOS 7 and GCOS 8 operating systems, launched a graduated pricing plan for GCOS 7, and announced new application software offerings.

The introduction of the DPS 7000 Series, of course, was just what DPS 7/E users were waiting for. The five-processor series provides DPS 7/E users with more powerful processors as well as a product migration path.

The first models of the 32-bit DPS 7000 line, announced in April, became available in August 1987. The DPS 7/Es are no longer available, although users can still obtain DPS 7/E add-on products and upgrades. The 7000 Series models are being manufactured by Groupe Bull of France, which owns a 42.5 percent interest in the new Honeywell Bull triumvirate. The other two partners include Honeywell Inc., which also owns 42.5 percent of Honeywell Bull, and NEC Corporation of Japan, which owns 15 percent of the company.

Each model of the DRS 7000 Series is upgradable to the next highest model in the series. The DPS 7000 machines are positioned as "enterprise-wide" computers that are tuned for high-volume transaction processing, although the low-end model can be used as a departmental satellite machine. Within the current Honeywell Bull product line, the DPS 7000 Series is positioned above the DPS 6 PLUS and below the new DPS 8000 medium-to-large scale mainframes, announced in June 1987.

The new Honeywell Bull DPS 7000 Series processors are positioned as medium-scale organizational and departmental machines. The new series replaces the Honeywell Bull DPS 7/E mainframes, which are no longer in new production.

MODELS: Models 10, 20, 30, 40 single processors and the Model 50 dual processor.
CONFIGURATION: The 7000 Series features one- and two-processor models, 4 to 16 megabytes of main memory, and four to eight channels.
COMPETITION: Control Data 930; Digital Equipment Corporation VAX 8200 and 8300; IBM 9370 Information System and System/38; NCR 9800; Unisys 2200, A 3, and A 5.
PRICE: $112,400 to $181,200.

CHARACTERISTICS

MANUFACTURER: Honeywell Bull Inc., 300 Concord Road, Billerica, Massachusetts 01821. Telephone (617) 895-6000.

MODELS: Honeywell Bull Models 10, 20, 30, 40, and 50.

DATA FORMATS

BASIC UNIT: Eight-bit byte plus one parity bit. The data paths are four bytes (32 bits) wide. Data can be interpreted as binary, decimal, hexadecimal, or alphanumeric.

FIXED-POINT OPERANDS: Data bits are interpreted in groups of four (packed or unpacked decimal data) or eight (alphanumeric EBCDIC), or in strings of between 16 and 64 (binary digits). The strings can be interpreted as signed for fixed-point binary numbers.

The new Honeywell Bull DPS 7000 Series, the replacement for the DPS 7/E Series, is designed to handle high-volume transaction processing and supports manufacturing and health industry applications. The Model 30, shown in the photo, is configured with eight 500-megabyte mass storage units, a 900 lines-per-minute printer, and a 1600/6250 bits-per-inch magnetic tape subsystem.

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Honeywell Bull became one of the latest vendors to offer graduated pricing since IBM began the new software pricing trend in 1986 with the introduction of its competing 9370 Information System superminis. With the announcement of the DPS 7000, Honeywell Bull unveiled a new graduated pricing scheme for GCOS 7 operating system software. Software products are now priced at three levels that correspond to the power range of the central processor. Honeywell Bull also announced the availability of new mass storage, tape, and printer peripherals that can be attached to the DPS 7000, although users can reconnect most of the existing DPS 7/E peripherals using separately priced reconnection kits.

The new product line addresses manufacturing and health industry markets, two established Honeywell Bull niche markets. Software products addressing these market segments include the Honeywell Bull Manufacturing System/7 (HMS/7), now available for the DPS 7000, and the Patient Care Management System, the first component of Honeywell Bull's Comprehensive Hospital System.

The five models include the Models 10, 20, 30, 40, all single-processor systems, and the top-end Model 50, a dual-processor system. System memory ranges from 4 megabytes to 16 megabytes, and channel capacity ranges from four to eight I/O channels. Unlike the other models, the Model 10 is a packaged system that has 700 megabytes of mass storage and a 1600 bits-per-inch (bpi) magnetic tape unit in addition to the other DPS 7000 standard features.

Additionally, all the models come with the Service and Administration Processor (SPA) service processor that monitors all system components, supports maintenance, and implements testing and diagnostic routines activated locally or remotely. All processor models can also be outfitted with Datanet 8 front-end communications processors.

The system CPU, I/O processors, and memories make use of new very-large-scale integration (VLSI) complementary metal oxide semiconductor (CMOS) chips and 256K-bit memory chips. A company spokesperson said at some point 1-megabit chips will be available, but could not specify when. The CMOS chips feature 22,000 ports per chip. The CPU uses 10 VLSI chips and has an internal transfer capacity of 27 megabytes per second. It features a cache memory of 64 kilobytes, a control memory of 192 kilobytes, and a clock cycle time of 150 nanoseconds. I/O transfer rate ranges from 1.25 megabytes per second to 2.5 megabytes per second per channel.

Similar in its approach to other medium- and large-scale Honeywell Bull systems, the vendor places much market emphasis on transaction processing applications. The entry-level Model 10 system handles up to 9,000 TP1 benchmarked transactions per hour, and a fully configured, top-end Model 50 handles up to 600 terminals and 52,000 transactions per hour.

FLOATING-POINT OPERANDS: Data can be represented as floating-point operands with single- (16 bit) or double- (32 bit) precision formats.

INSTRUCTIONS: The DPS 7000 instruction repertoire consists of 221 instructions, including operations for address computations and arithmetic instructions for performing fixed- and floating-point decimal and binary operations on packed or unpacked data. Operands can be binary, fixed or floating point, or decimal in packed or unpacked format; bytes; byte strings; or bit strings.

INTERNAL CODE: EBCDIC.

MAIN STORAGE

Memory is organized into consecutively numbered byte locations. Four-byte blocks are always accessed regardless of operand size. Half-word (16 bit) operands must begin on even-numbered byte locations, and full-word (32 bit) and double-word (64 bit) operands must begin on byte locations divisible by four.

STORAGE TYPE: 256K-bit complementary metal oxide semiconductor (CMOS) chip technology.

CAPACITY: See Table 1.

CYCLE TIME: See Table 1.

CHECKING: Each item of data stored in memory units and in control store is accompanied by a Hamming code (seven bits for every four data bytes) which permits the correction of single-bit errors and the detection of double-bit errors. Data paths, and particularly the bus, perform parity checks to ensure data integrity. All registers and calculation circuits include a key check.

RESERVED STORAGE: The DPS 7000 protects every segment individually with an automatic system of rings and protection levels. This protection system, implemented by hardware and firmware, protects segments on the basis of the information they contain rather than their physical location.

The main processor, while executing a process, may be at one of four levels of privilege, called "rings." Rings are numbered from zero to three, with zero being the most privileged. A ring number is allocated to each segment when it is created and, when the process is entered, the main processor adopts this ring number. Each segment is allocated three protection levels, one for each possible use: read, write, or execute. Each level can be anywhere within the range of zero to three. At every reference to an address in a segment, the protection level for the relevant type of use is checked against the current ring number of the main processor. Access is only allowed for read and write access; when the ring number is less than or equal to the protection level; for execute access; and when the ring number is within the range between the write and execute protection levels. At linking time, the programmer specifies protection levels; this feature controls access to process segments from other active programs.

CENTRAL PROCESSORS

DPS 7000 processors are 32-bit systems using very large scale integration (VLSI) complementary CMOS chips within the CPU, input/output (I/O) processors, and system memory. The components feature 22,000 ports per chip. The CPU, packaged with 10 VLSI chips, has an internal transfer rate of 27 megabytes per second and a clock cycle

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TABLE 1. SYSTEM COMPARISON

MODEL	Model 10	Model 20	Model 30	Model 40	Model 50
SYSTEM CHARACTERISTICS					
Date announced	April 1987	April 1987	April 1987	April 1987	April 1987
Date first delivered	1988	September 1987	August 1987	August 1987	Fourth-Quarter 1987
Field upgradable to	Model 20	Model 30	Model 40	Model 50	Not applicable
Relative performance	1	1.3	2.5	3.3	6.0
Number of processors	1	1	1	1	2
Cycle time, nanoseconds	150	150	150	150	150
Word size, bits	32	32	32	32	32
Operating systems	GCOS 7	GCOS 7	GCOS 7	GCOS 7	GCOS 7
MAIN MEMORY					
Type	256K-bit CMOS	256K-bit CMOS	256K-bit CMOS	256K-bit CMOS	256K-bit CMOS
Minimum capacity, bytes	4M	8M	8M	8M	8M
Maximum capacity, bytes	4M	16M	16M	16M	16M
Increment size, bytes	Not applicable	4 or 8M	4 or 8M	4 or 8M	4 or 8M
Cycle time, nanoseconds	300	300	300	300	300
BUFFER STORAGE					
Minimum capacity	64 kilobytes	64 kilobytes	64 kilobytes	64 kilobytes	128 kilobytes
Maximum capacity	64 kilobytes	64 kilobytes	64 kilobytes	64 kilobytes	128 kilobytes
Increment size	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
INPUT/OUTPUT CONTROL					
Number of channels:					
Byte multiplexer	0	0	0	0	0
Block multiplexer	0	0	0	0	0
Word	0	0	0	0	0
Other	4	4	4-8	4-8	4-8

To facilitate networking and connectivity, the DPS 7000 features PC-to-mainframe link functions and peer-to-peer networking. Peer networking is implemented through Honeywell Bull's Distributed Systems Architecture (DSA), which also conforms to the International Standards Organization (ISO) model for interconnecting equipment from other vendors.

On the software side, Honeywell Bull introduced Version 3 of the GCOS 7 operating system to run on the DPS 7000 Series. Through the use of menus and HELP screens, GCOS 7 can be used by both experienced and inexperienced users. The operating system uses Honeywell Bull's Integrated Data Store/II (I-D-S/II) data base management system and also supports Oracle, a relational data base management system from Oracle Corporation. Other components include software development tools, fourth-generation languages, and networking software. Software development tools include data dictionaries and other software packages available from third-party software vendors.

COMPETITIVE POSITION

The DPS 7000 was announced just weeks after the official formation of Honeywell Bull. The timely move helped to assure existing Honeywell users that the company intends to remain a serious competitor.

The DPS 7000 mid-range, 32-bit mainframes in a perform range roughly between 0.65 to 3.8 millions of instructions per second (MIPS). Within this performance range they compete with several medium-range mainframe products, most of which were also introduced within the last year. These include the IBM 9370 Information System superminis, the Unisys (Burroughs) A 3 and A 5 entry-level mainframes, the Unisys (Sperry) 2200 "mid-frame," and the Control Data 930. The 7000 also competes against the IBM System/38 minicomputers, a mature product line that will probably be replaced within a year or so by a new generation of minis.

time of 150 nanoseconds. Single-processor systems also feature a 64-kilobyte cache memory, while the dual-processor Model 50 features a twin cache with a total capacity of 128 kilobytes.

The 7000 Series uses a bus-oriented architecture. The central processors, I/O processors, and memory units all communicate with one another through the high-speed bus.

Major CPU components include a memory cache unit (MCU), a basic processor unit (BPU), and control store unit (CSU). The MCU is a high-speed memory designed to reduce accesses to main memory and reduce bus-access contention. The MCU contains portions of main memory and tries to anticipate what information will be referenced.

The CSU is a writable memory containing the microprograms that control the execution of all the functions implemented in the CPU. The unit contains 16 kilowords of 96 bits each or the equivalent of 192 kilobytes.

The BPU consists of functional units that break down parts of instructions and data types to perform a specific specialized function. The BPU includes two essential parts. The first part includes the Address Preparation Unit (APU) and the Data and Instruction Unit (DIU). The APU handles address preparation and interfaces with the memory cache. The DIU executes arithmetic and logic operations on all data types and interfaces with the CSU. The second part of the BPU includes three functional units, an arithmetic and logic unit (ALU), a pilot unit (PIU), and a scientific unit (SFU). The ALU performs arithmetic and logic operations on decimal and fixed-point 32-bit operands, except for fixed-point multiply and divide operands which are handled by the SFU. The PIU controls the sequencing of microprograms addressing the control store and implements bit testing and counters for microprogram loop control in addition to other functions. The SFU executes all floating-point instructions plus the fixed-point multiply and divide functions.

Firmware is also used in the DPS 7000 to perform functions traditionally performed by software. These include task management, procedure calls, and data protection.

The main processor is capable of recognizing and controlling a task, a unit of a program more significant than a

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Most of the new systems in this mid-range class are products of "downsizing." Typically, such systems offer the performance and features of more expensive mainframes, but are packaged like minis. The IBM 9370, for instance, brings the IBM System/370 architecture and operating systems down to the departmental level. These systems can be installed in an office and don't need a raised floor and associated computer room environment, making them less expensive to operate.

The DPS 7000 is marketed both as an enterprise-wide system and as a distributed system that can be part of larger Honeywell Bull communications networks. Like many competing products, the 7000 can be installed in an office without a raised floor. Unlike these other mid-range computers, however, the DPS 7000 Series is not a downsized extension of larger machines. Rather, the DPS 7000 is similar to the old DPS 7/E line in that it uses its own operating system, GCOS 7, a byte-oriented, 32-bit EBCDIC architecture, and CMOS semiconductors. By comparison, the larger Honeywell Bull machines, which include the DPS 8, 8000, 88, and 90, are ASCII-oriented, 36-bit-word machines that use Computer Mode Logic architecture and operate under the GCOS 8 operating system. DPS 7/E and 7000 users operating under GCOS 7 cannot migrate applications to the larger GCOS 8 machines without substantial code rewriting and recompilation. "It's not a trivial task," a Honeywell Bull spokesperson explained.

Both GCOS 7 and GCOS 8, however, use a similar data base and transaction processing system and use common file structures among other similarities. Over the years, a company spokesperson said, most of its medium-scale users have not needed to migrate to the larger operating environment, although there have been sites that rapidly outgrew Honeywell Bull medium-scale machines and needed to move up to a larger Honeywell Bull system.

Because the performance range of the older DPS 7/E Series was limited, the U.S. customer base remained a relatively small 350 users, while the worldwide base comprises about 3,000 users. To expand the base and to satisfy the needs of DPS 7/E and 7000 users who will need greater performance, Honeywell Bull officials have indicated larger follow-on models will be available in coming years. Eventually, the 7000 machines could overlap the performance of the DPS 8000 line. Although supporting two competing operating system environments seems to present potential problems, particularly for users who want to migrate to bigger Honeywell Bull systems, a spokesperson said the company has been supporting a substantial number of GCOS 7 and GCOS 8 environments outside of the U.S. without any particular problems.

IBM, of course, has supported multiple operating systems and architectures for some time. The company charted this course in order to address the specific needs and operating requirements of users with different levels of experience and data processing needs. The IBM S/3X line, for instance, is sold to small- and medium-size businesses that are not large enough to take on the expense and

single instruction. A task is a sequence of interdependent instructions. A program can comprise a number of tasks, each able to execute in parallel with the others (multitasking). This parallel execution of tasks requires a dispatching mechanism. On traditional machines, this mechanism required software intervention. On the DPS 7000, it is a built-in firmware function of the main processor.

The DPS 7000 uses firmware-controlled semaphores to interpret external events such as physical input/output termination, peripheral interrupts, operator interrupts, and messages from terminals. Using semaphores, it also synchronizes the execution of competing processes, passes messages between processes, and controls competing demands for system services.

A semaphore is a group of words containing a counter and a pointer to an associated queue. When the semaphore counter is negative, all the resources associated with it are busy and processes are awaiting completion. When the counter is positive, all processes are satisfied and resources are free. When the counter is zero, all resources are busy but no processes are waiting. This mechanism can be used in any situation involving processes waiting for the completion of any operation. In light of the semaphore approach, there are no interrupts as such. Any hardware or software event is handled through semaphores, combined with a masking feature used when high-priority events occur.

The DPS 7000 systems use eight 32-bit Base Registers for internal address computation, sixteen 32-bit General Registers for data handling and indexing, four 64-bit Scientific Registers for floating-point data handling, one 32-bit Stack Register pointing to the stack associated with the running process, and one 28-bit Boundary Address Register holding the lowest absolute main memory address accessible by software.

Running under GCOS 7, the relative addressing mechanism is based on segmentation and its aim is to make optimum use of memory space. Each program running under GCOS 7 on the DPS 7000 is executed as a collection of fully relocatable segments. A segment may reside in different places. As a program is being executed, its constituent segments may be moved around memory to make room for other programs, and, at times, some of its segments may even be temporarily removed from memory and placed on disk.

To avoid having to split a frequently used routine between two segments, segments can vary in size. Machine instructions used in the GCOS environment refer to segment-relative addresses without reference to the physical location of the referenced operand. The absolute address is calculated as the instruction is executed using a segment descriptor and a displacement within the segment. High-speed registers assist in address development.

SPECIAL FEATURES: A unit built into all DPS 7000 processors is the Service and Administration Processor (SPA). The unit includes specialized maintenance channels to monitor the operation of all system components and supports testing and diagnostic routines that can be implemented locally and remotely through the unit's own operating system. SPA includes a 5¼-inch diskette unit that can be used as an I/O device and also includes a 20-megabyte fixed disk used for operating system administration.

PHYSICAL SPECIFICATIONS: The DPS 7000 Series has an operating temperature range of from 50 degrees to 90 degrees Fahrenheit, but nominal range is 68 to 78 degrees Fahrenheit with a noncondensing relative humidity of

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complexity associated with IBM's System/370 architecture. On the other hand, many of IBM's larger customers who maintain both System/3X and System/370 environments want the convenience if compatible operating environments to share files and applications. To address these needs, IBM announced Systems Application Architecture (SAA), a new architecture that lets users develop a consistent software interface among IBM PCs, S/3X minis, 9370 superminis, and S/370 mainframes.

Similarly, Honeywell Information Systems, now part of Honeywell Bull, stressed cross-product consistencies over the years to facilitate transaction processing applications, a major marketing cornerstone. Honeywell Bull systems conform to the Distributed Systems Architecture (DSA), the company's networking architecture. DSA is an open architecture supporting peer-to-peer networks and conforms to ISO's Open Systems Interconnection (OSI) model for interconnecting equipment from other vendors.

IBM is now moving in a similar data communications direction with new software products that support peer-to-peer networking and OSI.

ADVANTAGES AND RESTRICTIONS

The five-model DPS 7000 replaces the three remaining models of the DPS 7/E. The new DPS 7000 line extends processing power beyond the range of the DPS 7/E line through the use of additional main memory capacity, faster internal throughput, and faster I/O transfer rates—a particular benefit for DPS 7/E users now running out of capacity. The DPS 7000 line ranges from 4 megabytes to 16 megabytes, while the DPS 7/E line ranges from 2 megabytes to 8 megabytes. Published MIPS ratings for the DPS 7000 range from 0.65 MIPS to 3.8 MIPS, while ratings for the DPS 7/E range from 0.66 to 1.36 MIPS. The DPS 7000 also handles up to 52,000 transactions per hour compared to the DPS 7/E which handles up to 22,500 transactions per hour, according to Honeywell Bull.

To improve performance and throughput over the DPS 7/E, the new product uses a new semiconductor technology. The VLSI CMOS chips are used in central processors, I/O processors, and system memory. I/O throughput now ranges from 1.25 megabytes per second to 2.5 megabytes per second per channel. The DPS 7/E features a throughput rate ranging from 1.25 megabytes per second to 1.81 megabytes per second. The DPS 7/E also uses both 64K-bit and 256K-bit memory chips, depending on the age of the installed processor, while the DPS 7000 line uses 256K-bit chips and at some later point will use 1-megabit chips.

To ease migration to the new processor line, DPS 7/E users can move most of their disk, tape, and printer peripherals over to the DPS 7000 line using special reconnect kits. Peripherals that can be moved over to the DPS 7000 include the MSU1007, MSU0452, MSU0555, and MSU0390 disk drives; the MTU0537 tape drive; and the PRU0909 and PRU1209 high-speed line printers. Older DPS 7/E peripherals that Honeywell Bull considers obsolete, such as card machines and some older printer fami-

45 to 55 percent. The power source must be single-phase, 120 volts ±10 percent or two-phase, 208 volts ±10 percent at 60 Hz ±0.05 Hz. The CPU cabinet set measures 25.6 inches wide, 37.5 inches deep, and 45.3 inches high and weighs 578 pounds. Heat output is 5,120 Btu/hour and power consumption is 18 kVAs. DPS 7000 processors can operate in an office environment.

CONFIGURATION RULES

The DPS 7000 line features five models. Memory ranges from 4 megabytes to 16 megabytes and channel capacity ranges from four to eight channels depending on model. Please refer to Table 1 for details about each model.

The low-end Model 10 is offered as a packaged system that features a central processor with 4 megabytes of memory, four I/O processors, a 1600 bits-per-inch (bpi) magnetic tape drive, two 350-megabyte mass storage units, a console CRT and printer, and an SPA with remote maintenance adapter.

Models 20, 30, and 40 feature a central processor with 8 megabytes of memory, expandable to 16 megabytes, 64 kilobytes of cache memory, an SPA, a console CRT, a printer, and a remote maintenance adapter.

A Model 50 features two central processors and 8 megabytes of main memory, expandable to 16 megabytes, 128 kilobytes of cache memory, an SPA, a console CRT, a printer, and a remote maintenance adapter.

Except for the entry-level Model 10, the first four required I/O channels must be ordered separately. Additionally, systems require at least one mass storage processor, at least two mass storage units, and one tape unit.

INPUT/OUTPUT CONTROL

Input/output (I/O) operations between peripherals and central processors are controlled by an I/O processor and peripheral processors. Each model features a minimum of four I/O channels that are not included with the DPS 7000 central processor. The channels are not included to make it easier to change channel types when new channel offerings become available, according to Honeywell Bull. Users can expand channel capacity in four-channel group increments. Currently, one channel type is available, the Peripheral Subsystem Interface (PSI), while other channel types will be available at a later date.

DPS 7000 I/O processors feature a transfer rate ranging from 1.25 megabytes per second to 2.5 megabytes per second for each individual processor channel. Processors can feature from four to eight channels depending on model. The[qm]
I/O processors include 64 kilobytes of memory for channel program execution and data buffering. For transaction processing environments, DPS 7000 systems can handle from 9,000 to 52,000 transactions per hour based on the TP1 industry-standard benchmark. A fully configured top-end Model 50 can handle up to 600 terminals.

MASS STORAGE

Please refer to Table 2 for descriptions of mass storage units available for the DPS 7000 Series.

INPUT/OUTPUT UNITS

Please refer to Table 3 for information about Honeywell Bull tape and printer products for the DPS 7000 Series.

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TABLE 2. MASS STORAGE

MODEL	MSU0390	MSU0402	MSU0452	MSU0555
Cabinets per subsystem	1	1	1	1
Disk packs/HDAs per cabinet	1	1	1	2
Capacity	300MB	100MB	200MB	1200MB per drive
Tracks/segments per drive unit	Not specified	Not specified	Not specified	Not specified
Average seek time, msec.	25	25	25	25
Average access time, msec.	33.3	33.3	33.3	33.3
Average rotational delay, msec.	8.3	8.3	8.3	8.3
Data transfer rate	1,200,000 bytes/sec.	806,000 bytes/sec.	806,000 bytes/sec.	1,065,000 bytes/sec.
Controller model	MSP4270	MSP4575	MSP4575	MSP4575
Comments	Removable	Removable	Removable	Fixed

lies, cannot be moved to the DPS 7000. Many of these products are now considered old enough to be written off. Users not ready to write off their hardware can cluster DPS 7000s within installed DPS 7/E configurations. Under this arrangement, a DPS 7000 can be loosely coupled with a DPS 7/E through crossbarring, dynamic switching, and cabling. Loose coupling allows two versions of GCOS 7 to run simultaneously on both systems. Users can readily share files and peripherals within the joined systems. This arrangement can be beneficial to sites requiring additional power and system redundancy.

The new product line runs under Version 3 of the GCOS 7 operating system, which is compatible with the previous version, making it possible for DPS 7/E users to port existing applications over to the DPS 7000. Both the DPS 7/E and DPS 7000 operating under GCOS 7 continue to feature peer-to-peer networking capabilities and PC-to-mainframe links. Additionally, both product lines can run the Oracle relational data base from Oracle Corporation. Mantis and IQS fourth-generation languages are also available to both product lines.

Honeywell Bull announced a new graduated operating system pricing structure with the introduction of the DPS 7000. The initial software license fee is divided into three pricing groups based on power of the central processor. In addition, users are charged a small, graduated monthly license fee beginning 13 months after the initial agreement. The graduated pricing follows an industry trend that has been taking shape for the last year. The multilevel pricing approach is supposed to make system software more affordable to entry-level users, who may object to paying the same fee for software as larger user sites. Of course, users at the big sites will not appreciate having to pay the largest fees for software licenses. As an option, users can choose to pay only a nongraduated monthly license fee not based on model power range. □

TERMINALS

Please refer to Table 4 for terminals that can be used with the DPS 7000 Series.

COMMUNICATIONS

The DPS 7000 Series incorporates connectivity and peer-to-peer networking capabilities. Peer-to-peer capabilities are implemented using Distributed Systems Architecture (DSA), Honeywell Bull's open networking architecture. DSA conforms to the International Standards Organization (ISO) Open Systems Interconnection (OSI) model, making it easier for Honeywell Bull systems to communicate with other vendors' equipment which conforms to the OSI model.

In addition to peer networking, the DPS 7000 systems permit micro-to-mainframe links. Personal computer users running MS-DOS can connect directly to a DPS 7000 machine. Through a personal computer, PC users can access PC functions and all DPS 7000 functions. Users can also download GCOS 7 operating system data to the PC for use with such software packages as Lotus 1-2-3 or Framework.

To handle networking and data communications functions, users can configure DPS 7000 systems with DATANET 8 front-end communications processors. Using a Honeywell Bull DPS 6 minicomputer, DATANET processors can handle line, protocol, and message management and, in general, manage the network load for the central DPS 7000 processor. Depending on DPS 7000 model, the DATANET frontend can handle from 3 to 255 lines and up to 600 terminals.

The DATANET 8 Series includes the 8/05, 8/10, 8/20, and 8/30, which operate within Honeywell Bull's DSA. Up to two DATANET processors can be configured per system.

The DATANET 8 processors operate under the control of the Distributed Network Supervisor (DNS) software executive. These processors manage data communications traffic for Honeywell Bull DPS 7, DPS 7000, DPS 8, DPS 8000, DPS 88, or DPS 90 large systems operating under GCOS 8 or GCOS, or for DPS 7, DPS 7E, and DPS 7000 medium systems operating under GCOS 7.

Features common to all network processors in the DATANET 8 Series include:

- **Capability to interconnect systems using private networks that use High-Level Data Link Control data communications links**
- **Capability to connect to PDNs, to VANs, using the CCITT X.25 interface, and to most types of standard digital or analog, leased or switched data communications lines**
- **Capability to attach terminal devices**
- **System Control Facility for remote maintenance**
- **Console access for network management functions**

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TABLE 2. MASS STORAGE (Continued)

MODEL	MSS4979	MSU1007	MSU4101
Cabinets per subsystem	3	1-4	2-16 devices
Disk packs/HDAs per cabinet	3	2	2 devices
Capacity	900MB	1000MB per unit	500MB per device
Tracks/segments per drive unit	Not specified	Not specified	24
Average seek time, msec.	25	20	20
Average access time, msec.	33.3	28.3	28.3
Average rotational delay, msec.	8.3	8.3	8.3
Data transfer rate	1,200,000 bytes/sec.	1,810,000 bytes/sec.	1,815,000 bytes/sec.
Controller model	Integrated	MSP4370	Integrated
Comments	Removable	Fixed	Fixed

- Integrated 5¼-inch diskette drive for executive software maintenance functions

In addition, all DATANET 8 Series processors require a visual display console.

Physical connections between DATANET 8 Series network processors and central systems are made through network processor channel options which include Peripheral Subsystem Interface (PSI) for DPS 7 and DPS 7000 systems or Direct Interface Adapter (DIA) channels for DPS 8, 8000, 88, and 90 systems. The options are determined by the central system. The network processor provides support for one to four connections to large systems or two connections to medium systems.

All four network processors are expandable from a basic to maximum configuration and use the same executive software, DNS

DATANET 8/05 is a single-processor system available only for the DPS 7000 Series. The model includes 1 megabyte of central memory, expandable to 2 megabytes, and a console CRT and DPS 7000 host connection. The 8/05 supports up to 15 lines and includes three RS-232-C/V.24 asynchronous/character synchronous ports.

DATANET 8/10 is a single-processor system which provides support for a maximum of 31 data communications lines. The basic system includes 1 megabyte of central memory expandable to a maximum of 2 megabytes. A 5¼-inch diskette drive for executive software support is also included with the basic system. A second 5¼-inch diskette drive is optionally available. A console visual display terminal is required with each DATANET 8/10. In addition, a hard copy printer may be required.

Three RS-232-C asynchronous data communications ports are included with each 8/10. Data communications interface adaptors and line interface module options make it possible to expand data communications ports to a maximum of 31 lines. These options accommodate line characteristics such as data transmission speed, asynchronous/synchronous operation, and physical interfaces such as RS-232-C, V.35, and X.21.

DATANET 8/20 is a single-processor system with cache memory and 1 megabyte of central memory. To increase[qm]
8/20 performance, users may add a second processor and its associated cache memory. Central memory may be expanded to 2 megabytes by adding a 1-megabyte memory option. A basic system also includes a 5¼-inch diskette drive for executive software support. A second 5¼-inch diskette drive is optionally available. A console visual display terminal is required with each 8/20, and a hard copy console printer may be required. Three RS-232-C asynchronous data communications ports are included with each DATANET 8/20. The basic system provides support for up to 31 data communications ports, expandable to 127 ports with power and line expansion module options. Expansion of individual data communications ports is accomplished by ordering various communications interface adaptors and line interface module options. These options accommodate line characteristics such as data transmission speed, asynchronous/synchronous operation, and physical interfaces such as RS-232-C, V.35, and X.21.

DATANET 8/30 is a single-processor system with cache memory and 2 megabytes of central memory. To increase 8/30 performance, users may add a second processor and its associated cache memory. Central memory may be expanded to 4 megabytes by adding a 2-megabyte memory option. A 5¼-inch diskette drive is included for executive software support, while a second 5¼-inch diskette drive is optionally available. A console visual display terminal is required with each 8/30, and a console hard copy printer may be required. Three RS-232-C asynchronous data communications ports are included with each 8/30. The basic system provides support for 159 data communications ports expandable to 255 ports with a line expansion module option. Data communications interface adaptors and line interface module options make it possible to expand individual data communications ports. These options specify line characteristics such as maximum speed, asynchronous/synchronous operation, and physical interfaces such as RS-232-C, V.35, and X.21.

DATANET 8/10, 8/20, and 8/30 processors are fully upward compatible with each other and prior DATANET 8 DSA product offerings. These network processors can coexist with pre-DSA products, making it possible for a user to migrate to a DSA network environment and retain pre-DSA network products.

Line options common to these DATANET models include:

- Multiline Communications Controller-16 (DCF8052). It accommodates up to four Communications Interface Adaptors.

- RS-232-C Asynchronous/Character Synchronous Integrated Communications Interface Adaptor (DCF8073). The adaptor has four RS-232-C communications ports, includes four 50-foot cables (DCE to DTE) for device attachment, and has a maximum data transfer rate per port to 19.2K bps.

- RS-232-C Bit Synchronous HDLC Integrated Communications Interface Adaptor (DCF8049). The adaptor has two RS-232-C communications ports, includes two 50-foot cables (DCE to DTE) for device attachment, and has a maximum data transfer rate per port to 19.2K bps.

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TABLE 3. INPUT/OUTPUT UNITS

Magnetic Tape Units	Number of Tracks	Recording Density, Bits/Inch	Encoding	Tape Speed, Inches/Sec.	Transfer Rate, Bytes/Sec.
MTU0537	9	1600/ 6250	PE/ GCR	125	200,000/ 781,000
MTS4101	9	1600	PE	25/ 75	40,000/ 120,000
MTU4104	9	1600/ 6250	PE/ GCR	125	200,000/ 781,250
MTS4370	9	1600/ 6250	PE/ GCR	25/ 75	40,000/ 468,000
Printers	**Printing Speed**	**Print Positions**	**Horizontal Spacing, Chars./Inch**	**Vertical Spacing, Lines/Inch**	**Form Size, Inches**
PRU0909	900 lpm	136	10	6 or 8	4 to 19 wide
PRU1209	1200 lpm	136	10	6 or 8	4 to 19 wide
PRU4904	650 lpm	136	10	6 or 8	4 to 19 wide
PRU4902	900 lpm	136	10	6 or 8	4 to 19 wide
PRU4903	1200 lpm	136	10	6 or 8	4 to 19 wide

- **Low/Medium Speed Asynchronous/Character Synchronous Communications Interface Adaptor (DCF8053). This adaptor is a nonintegrated adaptor which requires a minimum of one line interface module. It will accommodate up to four line interface modules. Maximum data transmission rate per line interface module is 19.2K bps.**

The following line interface modules are allowed with DCF8053:

- **RS-232-C/V.24 Asynchronous/Character Synchronous Line Interface Module (DCF8055). This module has one RS-232-C/V.24 data communications port, includes one 50-foot cable (DCE to DTE) for device attachment, and has a maximum data transmission speed to 19.2K bps.**

- **MIL-188-C Asynchronous/Character Synchronous Line Interface Module (DCF8059). This module has one MIL-188-C data communications port, includes one 50-foot cable (DCE to DTE) for device attachment, and has a maximum transmission speed to 19.2K bps.**

- **Medium/High Speed Character Synchronous/Bit Synchronous Communications Interface Adaptor (DCF8061). This option is a nonintegrated adaptor capable of supporting one medium-speed (to 19.2K bps) or one high-speed (to 64K bps) data communications line via one of the following line interface modules.**

The following line interface modules are allowed with DCF8061:

- **RS-232-C/V.24 Bit Synchronous HDLC Line Interface Module (DCF8062). This module has one RS-232-C/V.24 data communications port, includes one 50-foot cable (DCE to DTE) for device attachment, and has a maximum data transmission rate to 19.2K bps.**

- **X.21 Bit Synchronous HDLC Line Interface Module (DCF8064). This module has one X.21 data communications port, includes one 50-foot cable (DCE to DTE) for device attachment, and has a maximum data transmission rate to 64K bps.**

- **MIL-188-C Bit Synchronous HDLC/Character Synchronous Line Interface Module (DCF8067). This module has one X.21 data communications port, includes one 50-foot cable (DCE to DTE) for device attachment, and has a maximum data transmission rate to 64K bps.**

- **V.35 Bit Synchronous HDLC/Character Synchronous Line Interface Module (DCF8069). This module has one V.35 data communications port, includes one 50-foot cable (DCE to DTE) for device attachment, and has a maximum data transmission rate to 64K bps.**

- **Bell 301/303 Bit Synchronous/Character Synchronous Line Interface Module (DCF8071). This module has one Bell 301/303 data communications port, includes one 50-foot cable (DCE to DTE) for device attachment, and has a maximum data transmission rate to 64K bps.**

SOFTWARE

OPERATING SYSTEMS: The DPS 7000 processor series runs under Version 3 of the GCOS 7 operating system. Using automatic menus, command prompting, and HELP screens, the operating system is designed for both experienced and less experienced users. GCOS 7 features more than 200 functions that can be accessed through menus. A systems administrator can determine what functions should be available to a given user.

GCOS 7 Version 3 is composed of four components which include data base technologies, a development methodology, fourth-generation languages, and networking functions.

GCOS 7 is a virtual storage, multipurpose operating system containing features for both experienced and inexperienced operators. GCOS 7 is a menu-driven system that incorporates user-friendly features to guide inexperienced or untrained users through its many components. To enhance productivity, more experienced users can bypass some user-friendly features. GCOS 7 supports centralized, distributive, interactive, and batch processing and offers a data base management system. Similar to the previous operating system version, GCOS 7 can execute up to 64 concurrent activities. This latest version of the GCOS op-

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TABLE 4. TERMINALS

MODEL	VIP 7816/7826	VIP 7817/7827	HDS 7101/ 7102	HDS 7302/ 7304	HSD 7403/ 7404	HDS 7807/ 7808
DISPLAY PARAMETERS						
Max. chars./screen	2000	2000	2000	2000	2000, 3300	2000, 3300
Screen size (lines x chars.)	25 x 80	25 x 80	25 x 80	25 x 80	25 x 80, 25 x 132	25 x 80, 25 x 132
Symbol formation	7 x 8 upper/ 7 x 9 lower	7 x 8 upper/ 7 x 9 lower	10 x 14	9 x 12	10 x 10 (80 col.)	10 x 14, 6 x 14
Character phosphor	P31 green	P31 green	Green or amber	Green or amber	Green or amber	Green or amber
Total colors/no. simult. displayed	None	None	None	None	None	None
KEYBOARD PARAMETERS						
Style	Typewriter	Typewriter	Typewriter	Typewriter (multifunc., low profile)	Typewriter	Typewriter (multifunction)
Character/code set	128 ASCII	128 ASCII	128 ASCII	190 ASCII/30 special	190 ASCII	190 ASCII/30 special
Detachable	Standard	Standard	Standard	Standard	Standard	Standard
Program function keys	12 standard	Not specified	10 standard	12 standard	14 standard	12 standard
OTHER FEATURES						
Buffer capacity	3 pages	Not specified	Not specified	Not specified	Not specified	Not specified
Tilt/swivel	Adj. keyboard (7826)	Adj. keyboard (7827)	Optional	Standard	Standard	Standard
Graphics capability	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
TERMINAL INTERFACE	RS-232-C; RS-422-A	RS-232-C; RS-422-A	RS-232-C; RS-422-A	RS-232-C; RS-442	RS-232-C; RS-422	RS-232-C; RS-422-A

erating system is compatible with the previous operating system. Users operating under Release 0501, the latest release of the previous GCOS, can migrate to GCOS 7 with minimal transition requirements, according to Honeywell Bull. GCOS 7 also includes transition products to help users migrate from certain IBM source-code programs. These include Cobol programs written for IBM 360/370 systems, IBM System 3 Cobol, and IBM System/3 RPG II.

Honeywell divides operating system functions into three parts: production system, information system, and development system. The production system component includes data base management and transaction processing features. Information functions involve utilities for retrieving and processing data and text with emphasis on management and end-user access to information. Development system functions include such tools as a data dictionary and menus to speed up program development time. Basic components of GCOS 7 include multitasking, virtual memory, diagnostics, resource allocation, CPU dispatching, and load balancing. Other major components include language compilers and networking products. Communications support is provided through DSA networking software.

GCOS 7 is built around a large set of menus, prompts, HELP text, and an interactive command language. Menus display functions for selection, the prompts provide brief descriptions of parameter entries, and the Help text supplies detailed explanations on request. Another related feature is the GCOS Command Language (GCL). This interactive command language lets users define and create command sequences. GCL includes the functions of Job Control Language and Operator Control Language.

The Command Management Function of GCL allows the system administrator to set up "environments" which are sets of commands and menus tailored to the needs of categories of users.

GCOS 7 uses virtual storage memory management techniques. To put main memory to most efficient use, system code, user code, and data segments can be relocated automatically. Hardware, firmware, and software all work in concert to achieve this efficiency. To establish CPU execution priorities, GCOS 7 uses four dispatching algorithms:

- Event-driven CPU-time by class;
- Slicing CPU-time within a class;
- Limiting CPU-time within a class; and
- Optimizing CPU and I/O-bound jobs in adjacent classes.

Resource allocation under GCOS 7 is flexible. Operators can mount tape and disk volumes on any available device. The operating system automatically recognizes the device and makes the mounted volume available to the executing job.

A job management system under GCOS 7 sets up priorities and determines when each job will be executed. A job scheduler uses a system of job classes and priorities to determine when each job will be executed. The system provides up to 16 user classes, 8 levels of scheduling priorities, and 10 levels of execution priorities.

As jobs flow through the system, job accounting information is collected at all stages. The system tracks job names, times, dates, memory and segment activity, and I/O activity. Such information can be edited for printing or used for billing or system analysis programs.

A GCOS 7 facility called the Catalog contains information about files, projects, and users. The Catalog enhances system security by controlling access to various files. The facility is part of a built-in data integrity and protection system. The Catalog contains information about data accessible to users and the programs they can run. To help ensure that work submitted to GCOS 7 will not be lost, system journals contain copies of records before and after processing.

Data integrity and recovery are maintained through a number of facilities provided for these purposes. These include the File Salvage Facility, which ensures that file status and file control information is correct following an incident. The Before-Journal Facility restores file contents in case of hardware, software, program, or Transaction Driven System (TDS) transaction failure. The Checkpoint/Restart Facility establishes a program restart point. Used in conjunction with the Before-Journal Facility, the utility repositions files and starts jobs at the last restart point. The

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After-Journal Facility records file updates as they occur, making it possible to recover files in case of volume destruction. Deferred Updating delays updating files until a unit of processing is completed successfully.

To assist in error detection and correction, GCOS 7 maintains a permanent log. When an error is detected and corrected, if possible, the permanent log is updated. Operators and service personnel can use the log for routine maintenance procedures and to monitor the status and error history of all system components. To pinpoint and correct errors, the log can be accessed by service personnel locally and remotely.

PROGRAMMING LANGUAGES: GCOS 7 supports Cobol, Basic, RPG II, Fortran, PL/1, Pascal, GPL, and APL.

DATA BASE MANAGEMENT: Under GCOS 7, Honeywell offers several products for master file updating, job scheduling, and the enhancing of batch/transaction processing throughput. GCOS 7 uses Honeywell Bull's Integrated Data Store/II (I-D-S/II) network data base management system which is tailored to large-volume transaction processing environments. To satisfy customer demands for a relational data base system, Honeywell Bull also offers the Oracle relational data base management system from Oracle Corporation. According to Honeywell Bull, Oracle is well adapted to query and decision-making systems.

In addition to the I-D-S/II data base management system, other major offerings include Integrated Query System (IQS) and Data Management 7 (DM7). DM7 combines TDS, Data Base Manager (DBM), Query, an inquiry processor, and Data Base Reorganization (DBREORG) in a single product. (For information about TDS, please refer to the Data Communications section.) DBREORG provides the data base administrator with the capability in interactive mode to physically reorganize the I-D-S/II data base according to schema DDL or DMCL modifications. The utility allows data base evolution without requiring specific user-written programs to unload and reload the data base. The utility also offers an "impact" phase with a command to compare the current schema with the desired schema in object form and to produce reports on all differences encountered and create a "transform schema."

I-D-S/II, the GCOS 7 data base manager, performs many functions in both batch and interactive environments. The facility includes an integrated manager; a utility for creating, administering, monitoring, maintaining, and validating the data base; and a dialogue capability. The data base can be accessed directly using Cobol verbs interactively.

Query is a procedure-oriented processor that provides for selection, retrieval, and formatting of information from all GCOS 7 data organizations (UFAS, I-D-S/II, BFAS, and MLDS). Originally made available under GCOS 64, Query is designed for use as a programming language for users with varying degrees of computer knowledge. Queries built under this product can help satisfy end-user needs for information in an immediately usable form. It includes special report formatting capabilities and a HELP facility. A Query processor option is available to update UFAS, I-D-S/II, and MLDS user-accessible data. The update option can be used in an interactive or batch processing environment and can use all the security features of GCOS 7 to protect data integrity.

IQS is a fourth-generation information retrieval and development system that generates reports and provides access to the data base. Users can generate *ad hoc* information requests and perform "what if" analysis of business statistics. The package is designed for both experienced data processing professionals and for users with little programming experience who want direct access to information.

The package features menus and HELP facilities and allows access using English-like commands. The facility provides multiple views of information and lets users tailor views to the needs of individuals or specific groups. Other features include a facility for creating, modifying, verifying, and scanning data and for access to the GCOS 7 Forms Management for generation of display formats. Simple or complex report generation for printing or display is also available.

DATA MANAGEMENT: File access methods available under GCOS 7 are Unified File Access System (UFAS), Basic File Access System (BFAS), and Multiple Logic Data Store (MLDS). UFAS, the main file access facility under GCOS 7, offers a single alternative to random, sequential, and indexed sequential files. With UFAS, users need not be concerned with the physical characteristics of file media. UFAS permits all record insertions to be handled totally within the main body of the file structure. This results in predictable performance over the life of the file, reducing the need for periodic performance-related file reorganization. UFAS also supports secondary indexing capabilities for indexed sequential files.

BFAS, an IBM 360/370-compatible file system, allows interaction between IBM and Honeywell GCOS 7 environments.

MLDS supports the methods and structures used in Honeywell Level 62 and IBM System/3 environments.

Data Dictionary simplifies the standardizing of terminology and helps eliminate redundancy. To help improve program development, the facility provides programmers with a complete picture of applications as they pass through different stages of development.

DATA COMMUNICATIONS: Communications and networking configurations are available through the DATANET 8 Series of front-end network processors. At the software level, GCOS 7 provides for a number of operating system facilities. These include the TDS, Basic Terminal Network Support (BTNS), Front-end Network Processor Support (FNPS), Virtual Communications Access Method (VCAM), Message Access Method (MAM), File Transfer Facility/6 (FTF/6), Remote Batch Facility/6 (RBF/6), Distributed Job Processing (DJP), Unified File Transfer (UFT), and Micro-Mainframe Link (MML).

TDS is a transactional monitor that allows users to communicate with the operating system through terminals and access data immediately. TDS controls user access to the I-D-S/II data base management system and to UFAS or MLDS files and maintains file integrity and recovery through the journals facility. Transactions can be written in Cobol or RPG II. Additionally, a special interface allows the linking of batch programs to TDS as though they were terminals.

TDS handles messages entered by a user through a terminal, the initiation of a processing routine specific to that type of message, the processing of the message, and the response sent to the terminal. A library of mostly user-written transaction processing routines (TPRs) corresponds to the various types of messages accepted by the system. TDS can handle many transaction types in a single session. Time and memory space are optimized by using a single copy of TPR even though the requests for that TPR

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may come from different terminals. With TDS, TPRs can be debugged interactively through use of IPCF.

The BTNS module works in conjunction with the Data Communications Controller. BTNS manages the physical operation of networks, allocates communications resources, transmits messages among terminal and program queues, and monitors network activity of the communications controller.

FNPS works with the DATANET 8 front-end processor and its resident DNS software to perform several operations. A major FNPS function is the managing of DATANET 8 interaction with GCOS 7. FNPS handles DATANET 8 requests, performs I/O channel control, executes buffer management, and checks DATANET 8 operations. It also controls administrative functions, statistics collection and journalization, and software loading and generation.

VCAM establishes logical connections between GCOS 7 communications-based applications and the communications network. MAM queues and dequeues the messages passing between the communications network and Cobol communications programs for user-written programs employing queued communications.

MML is a GCOS 7 function that allows file exchanges among GCOS 7 and IBM PC-compatible microcomputers. It also supports PC connection to host target applications. The PC will execute VIP Emulation Version 3 products and emulate a VIP7800 terminal.

FTF/6-DSA is used to exchange files between a DPS 7000 and DPS 6/microSystem 6/Level 6 systems running DSA6. File transfer may be initiated from a DPS 6 terminal via either DPS 6 or DPS 7000 interactive operator commands or through either DPS 7000 batch JCL or interactive commands entered from a terminal in the DPS 7000 network. File types supported for exchange include sequential, relative, and indexed files (UFAS/ANSI/ASCII). The file types at both ends must match. The number of simultaneous file transfers is limited only by performance. A deferred restart technique protects against loss of data.

RBF/6-DSA is used to accept job requests from a DPS 6/microSystem 6/Level 6 system running DSA6 for execution on DPS 7000. Job input can be submitted from a DPS 6 file or from a DPS 7000 file or device. The submitted jobs are then scheduled for execution on the DPS 7000. Remotely entered jobs can be controlled by an IOF user at a DPS 7000 terminal. Output can be directed to a file on the submitting DPS 6 or routed to another station including the DPS 7000. Print output transmitted to a DPS 6 running DSA6 is placed on a DPS 6 disk print file for later printing by the standard MOD 400 unspool utility.

DJP establishes communications between DPS 7000 systems through DSA networks. DJP permits remote batch job entry, message routing between systems, the automatic chaining or initiating of remotely submitted jobs, and monitors submitted jobs and receives generated output. The DJP Pass Through facility lets interactive users start new interactive sessions at other DPS 7000s connected through the DSA network without terminating their original sessions.

UFT is used to transfer information between two DPS 7000 systems through a DSA primary network. Data transfers can be initiated through a job or operator command.

Transactional Context Restart Facility (TCRF) is used to restart transactional applications on a backup system. The facility restarts TDS jobs in a short time without interrupting backup system operation.

PROGRAM DEVELOPMENT: To facilitate applications development, the operating system features fourth-generation language capabilities and data dictionaries. Specifically, Honeywell Bull offers the following third-party software:

- Sindia 7, a transaction code generator from Steria Diffusion.
- Mantis, an on-line fourth-generation application generator from Cincom Systems Inc.
- IQS, a fourth-generation language with relational views, and
- SQL, the industry-standard language used with Oracle.

Products designed to improve programmer productivity include Interactive Development Facility (IDF), Interactive Program Checkout Facility (IPCF), and Full Screen Editor (FSE). IDF creates environments for fashioning forms personally tailored to the needs and experience of users, including the creation of personal user commands. With IPCF, users have interactive commands to enable debugging programs through use of the same source-program elements (such as tags and data names) in which the programs are written. IPCF capabilities include stopping on an address, displaying or modifying the contents of one or more variables, and modifying a program's processing sequence. FSE, a screen-terminal-oriented source text editor, is a menu-driven facility that contains an extensive HELP system. The product permits the formatted entry of Cobol and RPG II programs. The product complements the line/context editor by providing easy, full-screen creation and maintenance of library members.

UTILITIES: Utilities available system wide include spooling-sorting-merging functions, code-forms-data management functions, system management facilities, networking, and transition tools.

Spooling functions are handled by the GCOS 7 Output Writer. This function automatically handles printed and punched output production, unit record resource sharing among competing activities, and the restarting or repositioning after an incident, all without the need for user intervention. Sorting and merging functions sequence tape and disk files through various methods.

Code management is handled through Library Maintenance and Text Editing facilities. Using this feature, libraries containing source, executable, binary, and shareable code for system and user functions can be created, managed, and deleted. These facilities can be used in batch or interactive environments and are supported by menus, prompts, and HELP text.

Forms management is handled through the Forms Management Utility. This feature simplifies forms creation, storage, and maintenance in transactional and interactive environments. Programmers can generate the forms by entering commands into the forms-generation utility. Among the terminals supported by the Forms Management Utility are VIP7800 (synchronous and asynchronous), VIP7700, and IBM 3270. FSE and Forms Management Utility services are available through other GCOS 7 processors, such as the IQS.

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Volume and file management are supported by a variety of utilities that can operate in batch or interactive modes. They are also supported by menus, prompts, and HELP text. At the volume level, utilities are available for preparing volumes, checking volume integrity, duplicating volumes, printing blocks of a volume, listing volume content, and saving or restoring volumes. Similar functions are also available at the file level. Additional file level functions include the ability to create a file, compare two files, reorganize an indexed file, sort and load secondary indexes, process file groups, and allocate or deallocate file space.

GCOS 7 includes an extensive set of conversion aids to assist in migrating programs and files from Level 62, IBM System/3, and IBM 370 systems.

OTHER SOFTWARE: Applications packages available for the DPS 7000 Series include the Honeywell Bull Manufacturing System/7 (HMS/7) and Patient Care Management System. The integrated packages address two established Honeywell Bull niche markets: manufacturing and the health industry.

HMS/7 is a Manufacturing Resource Planning (MRP II) system for integrated inventory and production control. The package contains six application modules. These include Inventory Record Management, Manufacturing Data Control, Material Requirements Planning, Master Production Scheduling, Statistical Forecasting, and Capacity Requirement Planning. HMS/7 can be integrated with the Honeywell Bull Factory Data Collection system using the new Host Application Interface for monitoring the shop floor.

The Patient Care Management System, a Honeywell Bull package developed for the DPS 7000 Series, is said to be the first component of the company's Comprehensive Hospital System, an on-line, modular hospital information product featuring an integrated data base, productivity tools, patient care accounting, and financial management applications. Patient Care Management is composed of 10 modules that handle patient admission, discharge, transfer and registration processing, patient scheduling, staff scheduling, order entry and results reporting, pharmaceutical processing, patient chart review, point-of-service billing, medication administration, patient acuity information processing, and care planning.

Other Honeywell Bull products under this category manage and control disk-space distribution and provide monitors for hardware and software resources. These include the Multiple Backing Store, a facility that distributes disk-stored virtual memory over up to seven disk volumes. This helps to better distribute storage load and optimize performance under heavy disk-load conditions.

General Access Control, another management tool, provides for protected access to the same files simultaneously from concurrently executing jobs operating in batch, remote batch, transactional, and interactive environments.

System Behavior Reporter, a third management tool, monitors and reports on the behavior of allocated hardware and software resources. Coupled Systems Support allows disk space to be shared dynamically by two GCOS 7 systems. File and data base access between the two systems can be partially or fully shared. The two systems sharing disk files can be different configurations operating at different levels of power.

The Remote Maintenance System (RMS) consists of a remote console interface adapter and software diagnostic interface modules combined to provide an extension to the system console for field engineers. The engineers are remotely located and connected via phone lines. RMS provides the ability to troubleshoot hardware and firmware problems as well as software bugs concurrently with user production. With this facility, key diagnostic programs that operate under GCOS 7 and 64 can be remotely executed, and patching of many software difficulties can be accomplished without an on-site visit. RMS operates only when the console operator places the system in maintenance mode and provides documentation of all communications via the system console.

PRICING AND SUPPORT

Honeywell Bull DPS 7000 systems are marketed primarily as purchase-only systems. The company has not published any lease charges, although users may call to request lease pricing quotes from regional offices and obtain a leasing plan tailored to specific needs.

In the software pricing area, Honeywell Bull now offers two software pricing plans. The first plan involves a new tiered pricing structure with the introduction of the DPS 7000. The initial software license fee and monthly license fee have been divided into pricing Groups A, B, and C based on power of the central processor. DPS 7000 Models 10 and 20 are classed as Group A machines, Models 30 and 40 are classed as Group B machines, and the Model 50 is classed as a Group C machine. Users with Group A machines will pay the lowest software rates, Group B machine owners will pay intermediate rates, and Group C machine owners will pay the highest rates. Users will pay a graduated license fee in addition to the small monthly license fee that begins 13 months after the initial agreement. As an option, users can choose a second pricing plan which calls for only a flat monthly license fee.

In the software price list at the end of this report, the first pricing column lists flat monthly license fee charges. The second and third columns list the graduated charges.

SUPPORT: On-call remedial maintenance is performed between the hours of 8 a.m. and 6 p.m. Monday through Friday, excluding Honeywell Bull published holidays. For scheduled maintenance beyond this period, the user pays an additional charge which is a fixed percentage of the basic monthly maintenance charge. As an alternative to scheduled extended maintenance, the user can obtain on-call maintenance service at standard hourly rates charged per working hour.

Honeywell Bull's Distributed Maintenance Services (DMS) is a term covering a variety of field engineering services, coordinated to assure maximum availability of the system. DMS includes a Response Center headquartered in Atlanta, Georgia for toll-free, 24-hour-a-day contact with Honeywell Bull; the Technical Assistance Center in Newton, Massachusetts, which coordinates all activities and provides remote testing and correction facilities; a Logistics Inventory Data System for rapid location of parts; Service Account and Field Engineering (FE) representatives; an Alert system to notify FE management of special problems; Remote Support Facility for remote troubleshooting and remote software and hardware correction; and tools for easy software updating by customers.

Honeywell Bull offers six categories of support products which include data services, system engineering, software, education, publications, and supplies.

Data services consist of machine time for predelivery production and checkout, and for overload/peak load situations.

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System engineering falls into one of five billable support categories. Field engineering managers are responsible for determining the degree of skill required to perform the job.

EDUCATION: Education services include standard courses, advanced professional training, multimedia self-instruction courses which allow customers to self-train as often as needed, site surveys to determine educational requirements, on-site classes, and clustered on-site classes to accommodate a group of users from an area.

TYPICAL CONFIGURATION: Sample configurations for the DPS 7000 are shown below. They do not include software. Please refer to the EQUIPMENT and SOFTWARE PRICES sections for a complete listing of purchase and maintenance prices.

SMALL CONFIGURATION:

Model 20 Central System includes 8 megabytes of main memory, service processor, remote maintenance attachment, console CRT, and printer	$ 58,000
CPF4905 first four I/O processors	12,000
MSS4101 Mass Storage Subsystem (1000MB)	41,400
MTP4475 Magnetic Tape Processor	36,200
Eight MTU0537 Magnetic Tape Units (1600/6250 bpi, 125 ips)	199,200
PRU0909 Belt Printer (900 lpm)	30,950
DATANET 8/20 Network Processor	38,000
TOTAL PURCHASE PRICE:	$415,750

MEDIUM CONFIGURATION:

Model 30 Central System includes 8 megabytes of main memory, service processor, remote maintenance attachment, console CRT, and printer	$ 88,000
CPF4905 first four I/O processors	12,000
CPF4101 second four I/O processors	24,900
CMM4101 additional 4-megabyte memory module	12,000
MSS4101 Mass Storage Subsystem (1000MB)	41,400
Two MSU4101 Mass Storage Units (1000MB)	27,800
MTP4475 Magnetic Tape Processor	36,200
Eight MTU0537 Magnetic Tape Units (1600/6250 bpi, 125 ips)	199,200
PRU1209 Belt Printer (1200 lpm)	35,950
DATANET 8/20 Front-end Network Processor	38,000
TOTAL PURCHASE PRICE:	$515,450

LARGE CONFIGURATION:

Model 50 Central System includes 8 megabytes of main memory, service processor, remote maintenance attachment, console CRT, and printer	$181,200
CPF4905 first four I/O processors	12,000
CPF4101 second group of four I/O channels	24,900
CMM4102 additional 8-megabyte memory module	22,800
MSS4101 Mass Storage Subsystem (1000MB)	41,400
Four MSU4101 Mass Storage Units; 500 megabytes per device	55,600
Two MTP4475 Magnetic Tape Processors	72,400
16 MTU0537 Magnetic Tape Units (1600/6250 bpi, 125 ips)	398,400
PRU4903 Belt Printer (1200 lpm)	35,900
DATANET 8/30 Front-end Network Processor	80,000
TOTAL PURCHASE PRICE:	$924,600

EQUIPMENT PRICES

		Purchase Price ($)	Maint. Price ($)
DPS 7000 PROCESSORS			
Model 10	System includes central processor with 4 megabytes of main memory, four I/O processors, 700-megabyte mass storage subsystem, 1600 bits-per-inch (bpi) magnetic tape subsystem, service processor with remote maintenance adapter, CRT console, and printer	112,400	491
Model 20	System includes central processor with 8 megabytes of main memory, service processor with remote maintenance adapter, console CRT, and printer	58,000	230
Model 30	System includes central processor with 8 megabytes of main memory, service processor with remote maintenance adapter, console CRT, and printer	88,000	320
Model 40	System includes central processor with 8 megabytes of main memory, service processor with remote maintenance adapter, console CRT, and printer	128,000	415
Model 50	System includes two central processors with 8 megabytes of main memory, service processor with remote maintenance adapter, console CRT, and printer	181,200	525
PROCESSOR OPTIONS			
CPF4905	First group of four I/O processors; required on Models 20, 30, 40, and 50	12,000	NC
CPF4101	Second group of four I/O processors; CPS4106/7/9 only	24,900	8
CMM4101	Additional 4-megabyte memory module	12,000	15
CMM4102	Additional 8-megabyte memory module	22,800	25

Honeywell Bull DPS 7000 Series

		Purchase Price ($)	Maint. Price ($)
Reconnection Kits and Switches			
CPF4106	System 7000 Interface; provides four diagnostic channels for reconnected peripheral processors which include MTP4475, MSP457X, and MSF457X. The feature is not required if MTP4102 is present on the system.	2,795	10
DCF7161	DATANET 8 reconnection kit for reconnection from DPS 7, 7/E, and Level 64 to DPS 7000	1,960	NC
MTK4474	MTP4475 Upgrade Kit; required for reconnection of magnetic tape processors to the DPS 7000	7,000	NC
KIT4670	Reconnection Kit for CPF4702; each cabinet may include one or two magnetic tape or mass storage processors. Each processor requires one channel of the CPF4106.	4,500	NC
KIT4675	Reconnection Kit for MTP4475 and CPF4712; each cabinet may include one or two magnetic tape or mass storage processors. Each processor requires one channel of the CPF4106; CPF4712 may include one or two MSP4270s.	4,500	NC
KIT4671	Reconnection Kit to switch SF4570 between DPS 7 and DPS 7000	950	NC
KIT4676	Reconnection Kit to switch MTF4475, MSF4575, and MSF4270 between DPS 7/E and DPS 7000	1,450	NC
KIT4225	Kit for reconnecting MSP4370 from DPS 7 or 7/E to DPS 7000	1,270	NC
KIT4226	MSF4370 Reconnection Kit to switch mass storage processors between DPS 7, 7/E, or DPS 7000	890	NC
MSF4577	High availability option for MSP4570/5; prerequisite for reconnection from DPS 7 and 7/E to DPS 7000	680	NC
PRK4102	PRU906 and PRU1205 Reconnection Kit	4,000	NC
PRK4103	PRU0909 and PRU1209 Reconnection Kit	4,000	NC
PSC4175	Peripheral Switch Controller (PSC); controls up to five PSFs	17,375	21
PSC4176	Additional PSC	6,000	6
PSF4108	DATANET Link Switch	4,400	6
PSF4107	Magnetic Tape Unit Switch	2,625	3
MASS STORAGE			
MSS4101	Mass Storage Subsystem with eight Mass Storage Unit (MSU) addresses; includes two 500-megabyte MSUs, cabinet, and space for two additional MSU4101 units	41,400	179
MSP4575	Single-Channel Mass Storage Processor; includes one group of three device addresses and requires MSF4577 before it can be attached to the DPS 7000	24,363	90
MSA4575	Group of three additional device addresses	3,075	22
MSF4575	Two-Channel Switch for MSP4575	9,518	26
MSS4979	Mass Storage Subsystem; 900-megabyte capacity; includes addressing for eight devices	60,000	597
MSP4570	Single-Channel Mass Storage Processor with one group of three device addresses; requires MSF4577 before it can be attached to the DPS 7000	32,275	90
MSF4570	Two-Channel Switch for MSP4570	9,518	26
MSU4101	MSU; 500-megabyte capacity	13,900	72
MSF4111	Additional mass storage cabinet; includes one 500-megabyte unit and space for three additional MSU4101 units	22,570	77
MSF4112	Manual/dynamic switch; switches on MSS4101 between two I/O processor channels	300	9
MSA4101	Eight additional addresses for MSS4101; allows eight additional MSU4101 attachments for a total of 16 addresses per mass storage subsystem	2,050	22
MSF4917	Dual access for one 500-megabyte unit	1,225	12
MSU0402	MSU; 100-megabyte capacity	20,805	131
MSU0452	MSU; 200-megabyte capacity	12,000	150
MSU0555	MSU; 1.2-gigabyte capacity	46,284	227
MSF0006	Dual Access Feature; for MSU0402/0452	2,070	13
MSF0014	Dual Access Feature; for MSU0555	4,140	23
MSP4270	Single-Channel Mass Storage Processor; includes eight device addresses for MSU0390	21,560	90
MSF4270	Two-Channel Switch for MSP4270	9,518	26
MSS4979	Mass Storage Subsystem; 900-megabyte system includes addressing for eight devices	60,000	597
MSP4370	Mass Storage Processor; includes cabinet and eight device addresses	27,000	90
MSA4370	Eight additional device addresses	2,050	22
MSF4370	Two-Channel Switch for MSP4370	300	9
MSU1007	Fixed-Media Storage Unit; two devices, 500 megabytes each	27,800	167
MSF1007	Cabinet for two additional MSU1007s	7,500	24
MSF0017	Dual Access for MSU1007	2,425	23
MSU0390	MSU; 300-megabyte capacity	25,000	204
MSK4026	Upgrades MSU0402 from 100 to 200 megabytes	1,000	NA
MAGNETIC TAPE EQUIPMENT			
MTS4101	Magnetic Tape Subsystem; includes one 25/75 inches per second (ips), PE, 1600 bpi streamer/start-stop tape unit	20,000	160
MTS4370	Magnetic Tape Subsystem; includes one 25/75 ips, PE/GCR, 1600/6250 bpi streamer/start-stop tape	27,000	240
MTU0427	Additional Magnetic Tape Unit for MTS4370	18,770	140
MTP4102	Single Channel Magnetic Tape Processor; includes CPF4106-System 7000 diagnostic interface	39,200	165
MTF4101	ASCII translator for MTP4102	4,900	14
MTF4475	Two-Channel Switch for MTP4475/4102	7,004	22
MTP4275	Magnetic Tape Processor, single access; addressing for eight devices	24,850	120
MTP4475	PE/GCR Magnetic Tape Processor; addressing for eight MTU0537 units; requires MTK4474 before it can be attached to the DPS 7000	36,200	165
MTF4407	ASCII to EBCDIC Translator	4,900	14
MTU0537	Magnetic Tape Unit; 125 ips, 1600/6250 bpi	24,900	268
MTU0532	Magnetic Tape Unit; 125 ips, 1600 bpi; requires MTF0060 before it can be attached to the DPS 7000	21,900	253
MTF0060	Upgrade Kit; adds 6250-bpi feature	3,000	15

NA—Not available.
NC—No charge.

Honeywell Bull DPS 7000 Series

System engineering falls into one of five billable support categories. Field engineering managers are responsible for determining the degree of skill required to perform the job.

EDUCATION: Education services include standard courses, advanced professional training, multimedia self-instruction courses which allow customers to self-train as often as needed, site surveys to determine educational requirements, on-site classes, and clustered on-site classes to accommodate a group of users from an area.

TYPICAL CONFIGURATION: Sample configurations for the DPS 7000 are shown below. They do not include software. Please refer to the EQUIPMENT and SOFTWARE PRICES sections for a complete listing of purchase and maintenance prices.

SMALL CONFIGURATION:

Model 20 Central System includes 8 megabytes of main memory, service processor, remote maintenance attachment, console CRT, and printer	$ 58,000
CPF4905 first four I/O processors	12,000
MSS4101 Mass Storage Subsystem (1000MB)	41,400
MTP4475 Magnetic Tape Processor	36,200
Eight MTU0537 Magnetic Tape Units (1600/6250 bpi, 125 ips)	199,200
PRU0909 Belt Printer (900 lpm)	30,950
DATANET 8/20 Network Processor	38,000
TOTAL PURCHASE PRICE:	$415,750

MEDIUM CONFIGURATION:

Model 30 Central System includes 8 megabytes of main memory, service processor, remote maintenance attachment, console CRT, and printer	$ 88,000
CPF4905 first four I/O processors	12,000
CPF4101 second four I/O processors	24,900
CMM4101 additional 4-megabyte memory module	12,000
MSS4101 Mass Storage Subsystem (1000MB)	41,400
Two MSU4101 Mass Storage Units (1000MB)	27,800
MTP4475 Magnetic Tape Processor	36,200
Eight MTU0537 Magnetic Tape Units (1600/6250 bpi, 125 ips)	199,200
PRU1209 Belt Printer (1200 lpm)	35,950
DATANET 8/20 Front-end Network Processor	38,000
TOTAL PURCHASE PRICE:	$515,450

LARGE CONFIGURATION:

Model 50 Central System includes 8 megabytes of main memory, service processor, remote maintenance attachment, console CRT, and printer	$181,200
CPF4905 first four I/O processors	12,000
CPF4101 second group of four I/O channels	24,900
CMM4102 additional 8-megabyte memory module	22,800
MSS4101 Mass Storage Subsystem (1000MB)	41,400
Four MSU4101 Mass Storage Units; 500 megabytes per device	55,600
Two MTP4475 Magnetic Tape Processors	72,400
16 MTU0537 Magnetic Tape Units (1600/6250 bpi, 125 ips)	398,400
PRU4903 Belt Printer (1200 lpm)	35,900
DATANET 8/30 Front-end Network Processor	80,000
TOTAL PURCHASE PRICE:	$924,600 ■