

Honeywell Bull DPS 90 Series

MANAGEMENT SUMMARY

UPDATE: While no major DPS 90 enhancements have been announced since the system's initial introduction in March 1985, the new corporate entity marketing the large-scale system, Honeywell Bull, has made its first year of operation a memorable one with the introduction of new medium- and large-scale product lines, new peripherals, and new software. The single biggest announcement affecting current and future DPS 90 users was the introduction of a new version of GCOS 8, Software Release 3000 (SR3000), which will run on all of the company's large-scale mainframe products. SR3000 will become widely available in March. Along with the announcement of a new GCOS release, Honeywell Bull unveiled Interel, a new relational data base management system which uses the ANSI-standard Structured Query Language (SQL). Other significant software announcements include Infoedge and the Development Center Nucleus, end user-oriented facilities containing tools for program development. Infoedge is a companion product for Interel. To address demand for higher density disk storage, Honeywell announced the availability of new disk units obtained from IBM Corporation on an original equipment manufacturer (OEM) basis. The MSU3381/3383 each feature a formatted capacity of 3.6 gigabytes and have a transfer rate of 3 megabytes per second.

A major component of SR3000 is Interel—integrated relational data base management software. The product includes an SQL interface and the Integrated Relational Dictionary System (IRDS). Interel's implementation of SQL is compatible with IBM's SQL/DS and DB2, Oracle from Oracle Corporation, Ingres from Relational Technology Inc., and the Teradata DBC/1012 data base computer. Interel will be available with GCOS 8 SR3000.

Other announced software products include Infoedge, a set of productivity tools for both technical and nontechnical users, and Development Center Nucleus, containing

Honeywell's top-of-the-line DPS 90 mainframe family includes one-, two-, three-, and four-processor models, plus a fully redundant dual system. The top-end DPS 90/94 can be configured with up to 256 megabytes of main memory and delivers three times the processing power of the DPS 88, Honeywell's previous top-end series.

The Distributed Processing System (DPS) 90, now the most powerful processor series in the Honeywell Bull lineup, was developed through a joint agreement between Honeywell and NEC Corporation of Japan and is largely based on NEC S-1000 processor technology. The DPS 90 can be the host processor in a vast computer network and is well suited for batch, interactive, transaction processing, and engineering/scientific applications.

MODELS: Single-processor DPS 90/91, dual-processor DPS 90/92, three-processor DPS 90/93, four-processor DPS 90/94, and the DPS 90/92T, a fully redundant version of the DPS 90/92.

CONFIGURATION: One to four CPUs, 32 to 256 megabytes of main memory, one to four input/output processors, and 16 to 64 channels.

COMPETITION: Amdahl 5890 Series, Control Data Cyber 180, IBM 3090 Series, NAS AS/XL Series, and Unisys A-15 and 1100/90.

PRICE: Prices range from \$3,550,000 to \$7,600,000.

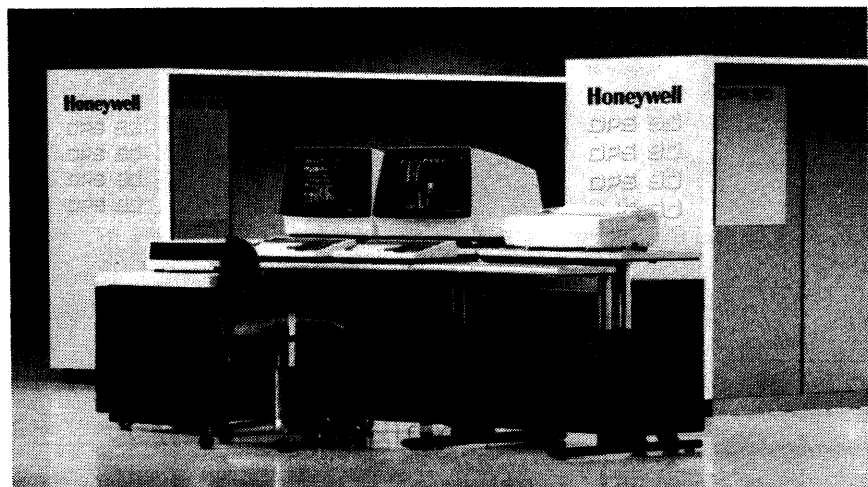
CHARACTERISTICS

MANUFACTURER: Honeywell Bull Inc., Deer Valley Computer Park, 13430 North Black Canyon Highway, Phoenix, Arizona 85029. Telephone (602) 862-8000.

MODELS: Honeywell Bull DPS 90 single-processor 90/91, dual-processor 90/92, fully redundant 90/92T, three-processor 90/93, and four-processor 90/94.

DATA FORMATS

BASIC UNIT: 9-bit bytes organized functionally to process 36-bit word groupings of information. Special features



Honeywell Bull DPS 90 Series

▷ products for DP professionals that address all stages of applications development. Infoedge products include an electronic spreadsheet, a forms generator, and a global menu system that integrates Infoedge optional packages into a single system.

Another new software product designed to enhance end-user productivity is the Personal Computer Interconnect (PCI) personal computer/host access software. PCI executes as an application layer on MS-DOS-based personal computers. The product supports Honeywell Bull Micro-System PC (AP and XP), IBM PC/AT/XT, and true IBM compatibles. PCI allows PC users to access host-based data, permits them to transfer data to a PC, and provides a state-of-the-art person/machine interface. PCI supports Honeywell Bull VIP terminal emulation, file transfer, script processing, and optional encryption and decryption of files. PCI can work with Lotus 1-2-3, dBASE III Plus, Multimate Advantage, WordStar Professional, ChartMaster, Spreadsheet Auditor, GEM, Bridge, and One Shot.

Honeywell Bull obtains the DPS 90 line from its minority partner, NEC Corporation of Japan. NEC owns a 15 percent interest in Honeywell Bull, while Honeywell Inc. and Groupe Bull of France each own 42.5 percent interests. Honeywell Inc. reserves the right to reduce its interest in the venture to 19.9 percent by 1988. The new, privately held entity began operations in March 1987. The three members of the new Honeywell Bull alliance have enjoyed a long industry association and have long maintained cross-licensing and joint-marketing agreements. Honeywell and NEC entered into a cross-licensing agreement in 1984 to develop the DPS 90 processor series—based largely on NEC S-1000 technology. Honeywell Bull continues to market DPS 90s worldwide.

Similar to other top-end systems in its class, the DPS 90 Series is designed to meet the needs of organizations with work loads growing at a rate of 20 to 50 percent annually. The DPS 90/91 single-processor mainframe is said to improve throughput by 30 to 70 percent over the single-processor DPS 88/81, depending on work load and application, while the top-end DPS 90/94 four-processor model provides up to 3.4 times the power of the DPS 90/91.

A planned follow-on to the DPS 90 will be based on the new NEC S-2000 processors, which, based on throughput, are expected to be 3 to 3.5 times more powerful than the current DPS 90 line. The follow-on line is expected to be available sometime in 1990.

DPS 8 users operating under the Honeywell CP-6 operating system can also migrate directly to a DPS 90 system. Honeywell made the CP-6 operating system available last year on the DPS 90 at the request of users who needed to migrate from DPS 8 configurations to more powerful systems.

▶ are also included for ease in manipulating 4-bit, 6-bit, 9-bit, and 18-bit groups; 72-bit double-precision groups; and 144-bit quadruple-precision, floating-point groups.

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

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

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

FLOATING-POINT OPERANDS: There are two floating-point formats—binary and hexadecimal. 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. Quadruple-precision floating-point operands, introduced with the DPS 90 Series, automatically use a hexadecimal exponent. The reason for two floating-point formats is to expand the exponent range of the floating-point operand.

INSTRUCTIONS: All basic instructions use one 36-bit word. The processor performs operations using 6-, 9-, 18-, 36-, and 72-bit operands. All single-word instructions use bits 0 through 17 for the address field, bits 18 through 27 for the op code, bit 28 as the interrupt inhibit bit, bit 29 as the address register bit, and bits 30 through 35 as the instruction address modifier. Multiword instructions use bits 0 through 17 for various functions as required, bits 18 through 27 as the op code, bit 28 as the interrupt inhibit bit, and bits 29 through 36 as the operand descriptor 1 modification field. Words 2, 3, and 4 contain the operand descriptor or indirect pointer for operands 1, 2, and 3, respectively.

The DPS 90 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. Additional instructions introduced with the DPS 90 include general instructions for fixed- and floating-point random number operations; vector instructions for fixed-point, floating-point, and logical operations on vectors with up to 256K elements each; and finally, a set of register-to-register instructions.

The basic instruction set of the DPS 90 contains more than 400 instructions, exceeding the instruction complement of the DPS 8 which is more than 300 instructions.

INTERNAL CODE: Nine-bit ASCII code is standard.

MAIN STORAGE

In DPS 90 systems, the Main Memory Unit (MMU) is packaged with the System Control Unit (SCU), a component that handles data, command, and interrupt traffic. To enhance throughput, the MMU employs eight-way interleaving. The MMU uses Error Checking and Correction (ECC) logic for single-bit error correction and double-bit

Honeywell Bull DPS 90 Series

TABLE 1. SYSTEM COMPARISON

MODEL	DPS 90/91	DPS 90/92	DPS 90/92T	DPS 90/93	DPS 90/94
SYSTEM CHARACTERISTICS					
Date announced	March 1985	March 1985	March 1985	March 1985	March 1985
Date first delivered	June 1985	April 1985	April 1985	1985	1985
Field upgradable to	DPS 90/92	DPS 90/92T	DPS 90/93	DPS 90/94	—
Relative performance	Not specified	Not specified	Not specified	Not specified	Not specified
Number of processors	1	2	2	3	4
Cycle time, nanoseconds	Not specified	Not specified	Not specified	Not specified	Not specified
Word size, bits	36	36	36	36	36
Operating systems	GCOS 8, CP-6	GCOS 8, CP-6	GCOS 8, CP-6	GCOS 8, CP-6	GCOS 8, CP-6
MAIN MEMORY					
Type	256K-bit MOS	256K-bit MOS	256K-bit MOS	256K-bit MOS	256K-bit MOS
Minimum capacity, bytes	32M	32M	64M	64M	64M
Maximum capacity, bytes	128M	128M	256M	256M	256M
Increment size	32MB	32MB	32MB	32MB	32MB
Cycle time, nanoseconds	Not specified	Not specified	Not specified	Not specified	Not specified
BUFFER STORAGE					
Minimum capacity	128KB	128KB	128KB	128KB	128KB
Maximum capacity	128KB	128KB	128KB	128KB	128KB
Increment size	NA	NA	NA	NA	NA
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	16-32	16-32	32-64	48-64	64

NA—Not available.

The DPS 90 line consists of five processor models: the single-processor DPS 90/91; the dual-processor DPS 90/92; the three-processor DPS 90/93; the four-processor DPS 90/94; and the DPS 90/92T, a fully redundant version of the DPS 90/92. The series features 256K-bit memory chips, current mode logic chips, and integrated vector-processing capabilities. DPS 90 memory capacity ranges from 32 to 256 megabytes. Additionally, all DPS 90 processors, except for the top-end DPS 90/94, are field upgradable to more powerful processors within the series.

The DPS 90 is designed to handle high-volume work loads in commercial, interactive, and engineering/scientific environments. DPS 90 models are designed to serve at the center of communications networks typically including other Honeywell Bull systems, ranging from the DPS 6 to the DPS 88 Series.

COMPETITIVE POSITION

For the more than 10,000 Honeywell sites worldwide, Honeywell Bull means stability. The alliance of three former technology partners has assured users that there will continue to be a Honeywell in their future for years to come. Investments in applications software and Honeywell Bull hardware will be protected.

When company founders formed the alliance comprising Honeywell, Groupe Bull, and NEC, they insisted on retaining *Honeywell* as part of the new corporate emblem to maintain name recognition in U.S. markets. But make no mistake, the second word that appears on the new company stationery is the name of the controlling partner. Five officers from Bull, including Bull CEO Jacque Stern, sit on the board of directors. Honeywell Inc. retains two seats, and NEC one seat.

Before the three-company merger, the old Honeywell Information Systems market share remained flat, according

error detection. Should part of the MMU fail, the affected part is released by the Input/Output Processor Maintenance System Operating Supervisor program to insure operating system continuity.

STORAGE TYPE: 256K-bit metallic oxide semiconductor (MOS) chips.

CAPACITY: See Table 1.

CYCLE TIME: Honeywell Bull does not release information about machine cycle times.

CHECKING: An 8-bit error-correcting Hamming code is appended to each 72-bit word pair. 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 90 has read, write, and execute permission bits in the Segment Descriptor. Within the DPS 90 Series, additional segment descriptors are implemented to describe very large data segments essential for vector operations. The Page Table Word (PTW) contains a write permit bit. Hardware also checks that data addresses generated during program execution do not exceed specified boundaries.

CENTRAL PROCESSORS

The DPS 90 central system includes the following modular components:

- Central Processing Unit (CPU)
- Main Memory Unit (MMU)
- System Control Unit (SCU)
- Input/Output Processor (IOP)
- Power Sequencer (PSQ)

Honeywell Bull DPS 90 Series

▷ to International Data Corporation (IDC), the Framingham, Massachusetts market research firm. In 1986, Honeywell had a 2.3 percent share of the large systems market—compared to 2.7 percent in 1985 and 1984 and 3.0 percent in 1983. If the new company is to succeed, IDC analysts believe, Honeywell Bull will have to turn around prospects in the U.S. market. According to industry observers, if anyone can do this, Bull—under the leadership of Stern and Francis Lorentz, Bull's chief operating officer—can. This is the same Bull management team credited with turning around Groupe Bull itself during the early 1980s and with making the French company a major player on the European scene. Except for peripherals and its association with Honeywell, Bull has not had much of a presence on these shores until now.

Initial Honeywell Bull financial results appear encouraging. During April, May, and June of 1987, the company reported a net income of \$1.8 million on revenues of \$508.2 million. During the fiscal year ended December 31, 1986, the predecessor operations generated revenues of \$1.9 billion. Financial data for the rest of this year was not available at press time. As a privately held company, the vendor is not obligated to publish quarterly results. Jerome J. Meyer, Honeywell Bull president and CEO, told *The Wall Street Journal* in November, however, that revenue was running about 10 percent above what the separate operations made in 1986. Greatest growth was occurring in Italy, while U.S. sales remained "relatively flat," Meyer told the *Journal*. To reduce costs, the company announced plans to lay off 10 percent of its U.S. workforce during 1988.

Shortly after formation in March 1987, Honeywell Bull got off to a strong start with the introduction of the new medium-scale DPS 7000, a system developed by Groupe Bull, and the DPS 8000 mainframe, a system designed and manufactured by Honeywell. The DPS 8000 systems, in particular, are directed at the heart of the traditional Honeywell user base. Responsibility for Honeywell Bull's biggest mainframe customers rest with NEC, manufacturer of the engines used in DPS 90 systems.

Since the DPS 90 became available in 1985, Honeywell Bull has installed more than 100 full systems. During the first two years of general availability many of the machines went to General Electric sites around the country that were migrating up from Honeywell DPS 88 systems. During 1987, Honeywell Bull has sold fewer systems to GE sites—their horsepower needs have been met for the time being. Instead, in 1987 most new systems have been installed at government and commercial sites. Although no single application predominates, communications, manufacturing, and engineering stand out as major markets. For the time being, Honeywell Bull will continue to sell to its own user base. Typically, these are users migrating from older DPS 8 and DPS 88 systems.

Like the Honeywell of old, Honeywell Bull continues to focus its marketing efforts on interactive processing, distributed systems, and scientific processing, areas that in- ▷

- ▶ • System Control Center (SCC)
- Interface Adapter Unit (IAU)

The DPS 90 Series, composed of modular processing components, makes use of a pipeline-type processing architecture, some parallel processing techniques, cache memory, and a high-speed address translation mechanism to enhance system throughput.

On the circuitry level, the processors make extensive use of Current Mode Logic (CML) logic chips and 256K-bit MOS memory chips. CML circuitry is used in the CPU, SCU, MMU, IOP, and high-speed channel processors. CML achieves faster switching speeds at a lower power consumption. It uses a higher density of logic gates per chip than transistor-to-transistor logic. Multichip carriers, called micropackages, incorporate a large number of densely packed large-scale integrated chips in one air-cooled assembly. The micropackage ceramic substrate has high-dissipation heat sinks and makes use of forced-air cooling.

The CPU executes instructions from both application and system programs. The unit contains a memory buffer unit; a prefetch unit and pipeline control; control store unit; execution unit; and diagnostic control unit. Functions include the decoding of instructions from the main memory unit; executing arithmetic, logic and, vector operations; and processing interrupts.

The memory buffer unit contains a 64K-byte operand cache and a 64K-byte instruction cache for a total of 128K bytes. Each cache is organized in 16-word blocks with set associative mapping. To maintain a high cache hit ratio, the buffer uses a least-recently used algorithm. The high-speed address translator uses the buffer to convert virtual addresses to real addresses. The address translation buffer contains two sets of 256 conversion pairs for the instruction cache and two sets of 256 conversion pairs for the operand cache. This retains virtual-to-real address translations and minimizes page table accesses. Virtual-to-real translations and cache accesses are executed in parallel to boost system speed. Eight-byte transfers from memory can move in parallel.

The Prefetch Unit and Pipeline Control implement the pipeline processing mechanism. The unit can process six instructions in various stages of execution simultaneously. Processed instructions moving through the pipeline may be in a decode cycle, address development cycle, page cycle, cache access cycle, execute cycle, or write cycle. Each stage is executed in one machine cycle. The prefetch unit, using the pipeline control mechanism, transfers an instruction read request to the memory buffer unit and decodes it. It also transfers operand read requests to the memory buffer. Additionally, the unit presents prefetched instructions and data to the execution unit and processes branch instructions.

The Control Store Unit controls the execution of the remainder of the pipeline, while also maintaining the integrity of all control stores, using error checking and correction.

The Execution Unit contains program registers and four arithmetic units. These include a basic arithmetic unit, a floating-point arithmetic unit, a high-speed multiplier, and a variable-length arithmetic unit. To reduce execution time, some frequently used instructions may be processed in parallel with preceding instructions. Furthermore, various arithmetic units can be used in parallel, providing an overlapped instruction sequence. ▶

Honeywell Bull DPS 90 Series

▷ Interest traditional mainframers such as IBM and many mini and supermini vendors.

In the connectivity and distributed systems area, Honeywell Bull offers Distributed Systems Architecture (DSA), a networking architecture Honeywell had originally developed with Groupe Bull before the emergence of Honeywell Bull. DSA supports DATANET network communications processors, network control facilities, and gateways to IBM's Systems Network Architecture (SNA). Honeywell Bull is also calling DSA the first networking architecture to support all seven layers of the Open Systems Interconnection (OSI) reference model, a proposed international standard for interconnecting hardware and sharing information across the product lines of different vendors.

In the interactive processing and fault-tolerant areas, Honeywell, and now Honeywell Bull, have long claimed a clear edge over comparable IBM systems. By Honeywell estimations, the DPS 90 is superior to the IBM 3090 Series in interactive processing and at least competitive with IBM in commercial batch processing capabilities. While all DPS 90 models maintain some degree of redundancy throughout, to minimize downtime, the DPS 90/92T is a full tandem version that features two of every major system component. During the first years of availability, a Honeywell Bull spokesperson said, many users concerned about reliability installed dual and tandem systems. Within the last year, however, many users migrating from multiple DPS 8 systems (at least 20 percent) are replacing their old systems with single-processor DPS 90s. Now that the DPS 90 has developed a track record, former multiprocessor users feel more comfortable with a single processor, the spokesperson said. Worldwide, about 60 percent of the DPS 90 users have installed single-processor systems, while 40 percent have installed multiprocessors.

Since the introduction of the product line, the DPS 90 has featured built-in vector capabilities intended for mixed application environments running both commercial and scientific work loads. DPS 90s can achieve peak performance ranging from 27 million floating-points per second (Mflops) to 108 Mflops depending on model, according to estimates published in *Computerworld*. The capability is offered to users who need a system that can handle scientific work, but who cannot justify the purchase of a more powerful dedicated supercomputer from Cray Research or ETA Systems. Typically, 20 percent of DPS 90 computing time at a given user site is devoted to scientific work, according to the spokesperson.

IBM Corporation and IBM plug-compatible vendor, NAS, both market high-end vector product lines using a similar marketing pitch. Amdahl, another major IBM plug-compatible vendor, sells a separate Fujitsu vector line with much higher peak performance. This product line competes against both the IBM 3090 Vector Facility and true Cray supercomputers.

▶ The Diagnostic Control Unit supports a number of operational, maintenance, and diagnostic functions. The unit controls CPU status logout, testing and diagnostics, display functions through keyboard operations of the system control center, and the reporting of scan-path testing.

The MMU uses MOS 256K-bit chips. A single MMU can be configured to contain 32 to 128 megabytes of main memory. Larger systems configured with two MMUs can contain up to 256 megabytes of main memory.

The SCU, packaged with the MMU, handles data, commands, and interrupt traffic among the various central components and provides system availability, maintenance, and diagnostic functions. A System Interface Unit, contained in the SCU, carries out the main functions of the SCU. The interface unit accepts requests and assigns data paths according to priorities and the configurations maintained by the configuration management unit. The SCU has interfaces for two CPUs, two IOPs, and two MMUs and has a direct connection to the service processor contained in the SCC from the SCU Diagnostic Control Unit.

The SCC controls the entire DPS 90 system, simplifies system interaction, monitors activities under the control of the operating system, initializes the system, and provides an interface to maintenance and diagnostic functions for Honeywell Bull maintenance contract customers. The SCC consists of a control unit, an operator panel, an operator display with keyboard, a status display with keyboard, two diskette drives, a fixed disk, an activity monitor, a timer feature, a serial printer, and a service processor. Built-in redundancy features ensure system availability.

The IAU contains two back panels, each supporting four general-purpose adapters. The adapters permit attachment of peripheral equipment complying with Federal Information Processing Standards. With additional back panels, the IAU may be configured with up to 14 general-purpose adapters.

The PSQ, packaged in a separate cabinet, is a required component that controls the power sequencing of central system units for either a motor-generator or an uninterruptible power system. The PSQ provides single-switch, power-on/power-off control for all central system components through the SCC.

The IOP handles data transfers between peripheral equipment and the MMU. Each IOP has four high-speed channel processors (HCPs) that, in turn, support four physical channels. In total, a maximum of 16 channels per IOP can be configured. In systems using a maximum of four IOPs, up to 64 channels can be configured. The four HCP high-speed I/O channel ports can achieve transfer rates of up to 3 megabytes per second. Channel types supported include high- and low-speed Peripheral Subsystem Interface channels, Direct Interface channels, and Data Streaming channels. All peripherals, except SCCs, are connected through the HCPs. SCCs connect to a separate multiplexer.

▶ The IOP, itself a computer, has a 1-megabyte local memory containing peripheral control and maintenance system software. The IOP, connected to the SCU, performs system start-up, initiates system reconfiguration, handles errors, and controls system test and diagnosis. Software residing in the IOP, the IOP Maintenance and Peripheral Supervisor, has two distinct parts. These are the IOP Software (IOPSW) and the Maintenance System Operating Supervisor (MSOS). IOP Software processes connects and interrupts, dispatch to other IOP software modules, logical-to-physical channel mapping, and report status. Maintenance System Operating Supervisor, the other soft- ▶

Honeywell Bull DPS 90 Series

TABLE 2. MASS STORAGE

MODEL	MSU0451	MSU0500	MSU0501	MSU3380	MSU3382	MSU3381/ 3383
Cabinets per subsystem	16	8-15	8-15	8	8	8
Disk packs/HDAs per cabinet	1	2	2	2 HDAs	2 HDAs	2 HDAs
Capacity	156MB	626MB	1.1GB	1.8GB	1.8GB	3.6GB
Tracks/segments per drive unit	815	1,630 per surface	1,686 per surface	13,275	13,275	26,550
Average seek time, msec.	30	25	25	15	15	17
Average access time, msec.	38.3	33.3	33.3	23.3	23.3	25.3
Average rotational delay, msec.	8.3	8.3	8.3	8.3	8.3	8.3
Data transfer rate	716KB/sec.	1065KB/sec.	1065KB/sec.	3MB/sec.	3MB/sec.	3MB/sec.
Controller model	MSP8021/8022/ 8023	MSP8021/8022/ 8023	MSP8021/8022/ 8023	MSP3881/3885	MSP3881/3885	MSP3881/3885
Comments	Removable	Fixed	Fixed	Fixed HDAs	Fixed HDAs	Fixed HDAs

From a basic technology viewpoint, the DPS 90 Series has remained relatively unchanged since its introduction. The product line continues to use 256-megabit memory chips, maximum memory capacity remains at 256 megabytes, and the data transfer rate remains at 3 megabytes per second. By contrast, competing mainframe vendors that introduced top-end systems at about the same time have since introduced performance enhancements and have added more memory, more channels, denser memory chips, and faster data transfer speeds. IBM 3090 systems, for instance, can address up to 2 gigabytes of real memory and now use 1-megabit memory chips. The IBM systems also have a transfer rate of 4.5 megabytes per second.

To date, Honeywell Bull has not disclosed any plans for enhancements. Under the current timetable, the company plans to introduce a DPS 90 follow-on line using S-2000 engines by 1990. A spokesperson said Honeywell Bull installed an S-2000 model at its Phoenix facility in December to test and develop the new follow-on product line.

ADVANTAGES AND RESTRICTIONS

As alluded to in the COMPETITIVE POSITION section, Honeywell Bull DPS 90, and GCOS 8 large systems in general, feature several pluses that help the product lines to address the vendor's traditional communications and distributed processing markets. The full tandem versions are designed for highly interactive environments that demand constant availability.

To enhance throughput, DPS 90s use a pipeline processing architecture, a technique that makes it possible to simultaneously process six CPU instructions in various stages of execution. DPS 90 main memory units also make use of eight-way interlacing that helps speed up memory accesses and increase throughput.

Another major DPS 90 advantage is vector processing. The processor line uses 63 new vector instructions that can be invoked using Fortran programs adapted to vector processing. This built-in, high-speed arithmetic ability is ideal for users whose occasional number crunching needs are not enough to justify the purchase of an expensive supercomputer. Honeywell believes organizations using CAD/CAM applications and engineering simulation could find the engineering/scientific capabilities beneficial. For

ware component, handles system initialization and boot-loading, maintenance chores, and error logging.

The central processor has six modes of operation: master mode, privileged master mode, slave mode, hypermode, nonextended segment mode, and extended segment mode. The first three modes are standard, while hypermode is actually part of the privileged master mode, and extended and nonextended segment modes are superimposed on the basic processor modes. The privileged master mode permits unrestricted access to all memory, permits the initiation of data transfer operations through the Input/Output Transfer Unit, and the setting of control registers. Master mode allows access to certain authorized portions of memory, while the slave mode is utilized by the operating system, when appropriate, and for execution of all user programs. These modes provide operating control and security in a multiprogramming environment. Hypermode is used to share CPU resources when diagnosing the health of the system. Hypermode allows direct access to reserved memory through a special base register. Extended segment mode can be set during a CLIMB instruction. In this mode, new 4-gigabyte data segments are allowed, the index and address registers are expanded to 36 bits, and the 21 new register-to-register instructions are enabled. Since registers are larger, the Safe Store Stack is expanded and instructions which load or store the registers operate differently to accommodate the expanded number of bits. It should be noted, however, that the GCOS 8 operating system currently limits the address space of a program to a working space of 64 megabytes.

SPECIAL FEATURES: The DPS 90 central processing system comes with integrated vector processing capabilities for engineering/scientific applications. Vectorized Fortran programs can invoke 63 vector instructions. The system supports vectorized processing on multiple data arrays of up to 4 gigabytes.

PHYSICAL SPECIFICATIONS: DPS 90 systems must be located on a raised floor providing at least 12 inches of space beneath the equipment. The room ceiling must be eight feet above the raised floor. Power requirements must meet the following specifications: Central system components require 208 V AC, +12 V AC, -28 V AC nominal; 3 phase at 50 or 60 Hz ±1 percent. A neutral is not needed. Peripherals require 208Y/120 V, ±10 percent; 60 Hz, or 380Y/220 V, +10 percent/-15 percent; 50 Hz, five wire which includes ground with a maximum phase variation of ±0.5 Hz maximum variation. Harmonic content is 6 percent or less of nominal frequency. Maximum phase variation is 6 degrees from 120 V nominal.

A temperature range between 68 and 78 degrees Fahrenheit with a relative humidity between 40 and 60 percent noncondensing is acceptable.

Honeywell Bull DPS 90 Series

TABLE 3. INPUT/OUTPUT UNITS

Magnetic Tape Units	Number of Tracks	Recording Density, Bits/Inch	Encoding	Tape Speed, Inches/Sec.	Transfer Rate, Bytes/Sec.
MTU0610	9	800/1600/6250	NRZI/ PE/GCR	200	100K/200K/1250K
MTU0630	9	800/1600/6250	NRZI/ PE/GCR	75 or 125	60-100K/120-200K/ 468.7-7781.2K
MTU8205	9	800/1600	NRZI/ PE	125	100K/200K
MTU8206	9	1600/ 6250	PE/GCR	125	200K/780K
MTU8208	9	1600/ 6250	PE/GCR	200	320K/1250K
Printers	Printing Speed	Print Positions	Horizontal Spacing, Chars./Inch	Vertical Spacing, Lines/Inch	Form Size, Inches
PRU0908	900 lpm	136	10	6 or 8	4-to-19 width x 3-to-11 length
PRU1208	1,200 lpm	136	10	6 or 8	4-to-19 width x 3-to-11 length
PRU1600	1,600 lpm	136 or 160	10	6 or 8	4-to-22 width x 3-to-22 length

scientific users who need to manipulate large amounts of data at one time, current DPS 90 real memory limitations could be a problem. As noted, while other vendors now offer main memories in the gigabyte range, maximum DPS 90 memory remains at 256 megabytes.

In the software area, Honeywell Bull continues to support GCOS 8, an operating system common to all of the vendor's large systems, ranging from the DPS 8 and the recently introduced DPS 8000 to the DPS 88 and top-end DPS 90. Before introducing the DPS 90, Honeywell modified its NEC engine to make it GCOS compatible. The common operating system makes it possible for users to migrate from DPS 8, 8000, and 88 systems to the DPS 90 without having to make major changes to operating system and applications software. Most peripherals used on previous Honeywell systems are also compatible with the DPS 90. GCOS 8 is not compatible, however, with GCOS 7, an operating system that runs on Honeywell Bull DPS 7 and DPS 7000 medium-scale systems manufactured by Bull. Users who want to upgrade from these to bigger GCOS 8 machines will have to do extensive code rewrites.

Environmentally, DPS 90 systems have an edge over DPS 88 systems. DPS 90s are air-cooled units, while DPS 88 system circuitry is cooled with chilled water. DPS 88 systems come with Thermal Exchange Pumps to circulate the liquid coolant. Users who cannot supply chilled water must buy a Thermal Exchange Air (TEA) Unit option, which dissipates heat into room air. The TEA option costs an additional \$30,000. □

► CONFIGURATION RULES

The five models operate under an enhanced version of GCOS 8 and are based on NEC Corporation large-systems technology.

The DPS 90/91 single processor consists of one CPU, one IOP with four high-speed channel processors, one MMU with 32 megabytes of main memory, one SCU, one PSU, one SCC with serial printer, and one IAU. Options include an additional IOP and up to 96 megabytes of additional memory in 32-megabyte increments.

The DPS 90/92 dual-processor system consists of two CPUs, one IOP with four high-speed channel processors each, one MMU with 32 megabytes of main memory, one SCU, one PSU, one SCC with serial printer, and one IAU. Options include an additional IOP and up to 96 megabytes of additional memory in 32-megabyte increments.

The DPS 90/92T tandem processor system consists of two of each central system component. The fully redundant version may be operated either as a single system or as two separate systems. Options include one or two additional IOPs and up to 192 megabytes of additional memory in 32-megabyte increments.

The DPS 90/93 three-processor system consists of three CPUs, three IOPs with four high-speed channel processors each, two MMUs with 32 megabytes of memory each, two SCUs, two PSUs, two SCCs with serial printer, and two IAUs. Options include an additional IOP and up to 192 megabytes of additional memory in 32-megabyte increments.

The DPS 90/94 four-processor system consists of four CPUs, four IOPs with four high-speed channel processors each, two MMUs with 32 megabytes of memory each, two SCUs, two PSUs, two SCCs, and two IAUs. Options include up to 192 megabytes of additional memory in 32-megabyte increments.

INPUT/OUTPUT CONTROL

Peripherals that can be connected to the DPS 90 include network processors, terminals, peripheral processors, disk and tape units, card readers and punches, and on-line and off-line printers. Disk, tape, and unit record devices are attached to various peripheral processors that control the

Honeywell Bull DPS 90 Series

► transfer of information between the device and the IOP. The various peripheral processor families are described below.

MASS STORAGE

The MSP3880 Series includes two mass storage processors which comply with the Federal Information Processor Standards, the MSP3881 and the MSP3885. The processors and the MSU3380/3381/3382/3383 mass storage units are purchased from IBM on an Original Equipment Manufacturer (OEM) basis.

The MSP3881 includes two storage directors and two IAU attachment channels. The MSP3885 includes two storage directors and four IAU attachment channels. The storage directors attach to the controller in the head-of-string mass storage units. The IAUs, in turn, attach to channels in the IOP on the central system.

The MSP8021/22/23 mass storage processors are designed to work with the MSU0451, 0500, and 0501 mass storage units. To make more efficient use of floor space, the processor series lets users configure selectable combinations of the MSP8021 storage processor line and the MTP8021 magnetic tape line in single compact cabinets. The MSP8021 freestanding single-channel processor supports up to 16 MSU spindles. The MSP8022 secondary single-channel processor supports up to 16 MSU spindles. The MSP8023 primary single-channel processor also supports up to 16 MSU spindles and is used when an MTP8021 magnetic tape processor is already installed. All MSPs can be field upgraded with optional dual-channel capabilities to provide redundancy and greater simultaneous access to mass storage units. MSPs can be configured with up to 16 removable-disk MSUs, eight fixed-disk MSUs, or a mixed combination of removable- and fixed-disk units.

Disk storage units available for the DPS 90 are listed in Table 2.

INPUT/OUTPUT UNITS

The MTP8021/22/23 are designed to work with the MTU0500, 0610, and 0630 magnetic tape drives. As described above, the magnetic tape processors can be housed in selectable combinations with the new MSPs to make more efficient use of floor space. The tape processors provide control for a string of tape units and connect to the bidirectional input/output data transfer paths of central systems.

The MTP8021 is a freestanding primary single-channel tape processor that includes 1600-/6250-bit-per-inch (bpi) capability and the first magnetic tape unit addressing feature. It can support up to eight tape units.

The MTP8022 secondary single-channel processor also includes 1600-/6250-bpi capability and the first MTU addressing feature. The processor can support up to eight tape units.

The MTP8023 primary single-channel processor includes 1600-/6250-bpi capability and the first MTU addressing feature. The MTP8023 is used when an MSP8021 is already installed. It can support up to eight tape units. Tape processors can be field upgraded with optional dual-channel capabilities to provide system redundancy and greater access to tape units. A single-channel tape processor can support up to eight tape units in a single-channel subsystem. The dual channel option provides two separate

channels in a tape processor, allowing the two channels to be interconnected. Both can support up to 16 tape units in dual simultaneous channel configuration.

The URP0600 or URP8901 Unit Record Processors can control up to eight unit record devices simultaneously. Unit record devices include card readers, a card punch that handles 100 to 400 cards per minute (cpm); a card reader/punch unit that reads at 400 cpm and punches at 100 cpm; and on-line, high-speed printers.

Magnetic tape subsystems and printers available for the DPS 90 are listed in Table 3. Card equipment is described in the EQUIPMENT PRICES section.

TERMINALS

Terminals available for the DPS 90 are listed in Table 4.

COMMUNICATIONS

The DPS 90 Series uses the DATANET 8 series of network processors to carry large-volume communications loads, allowing central processors to concentrate on information processing. DATANET 8s operate under Distributed Network Supervisor (DNS) software.

The DATANET 8 Front-end Network Processor (FNP) systems are designed for use in communications networks conforming to the *Distributed Systems Architecture (DSA)* and operate under the control of the DNS and GCOS 8. A maximum of four DPS 90 host connections can be configured, enabling the DATANET 8 to be shared by four DPS 90 host systems.

A single DPS 8, DPS 8000, DPS 88, or DPS 90 host system can support up to eight network processors concurrently. Also, a single DATANET can support up to four host systems concurrently. The channel links between the DATANET and host system may be dual- or cross-barred for redundancy. This configuration flexibility allows users to have a large central processing center with several large systems or a distributed environment with systems at several locations, operating in a peer-to-peer relationship through the DSA communications network. In addition, DATANET 8 processors may function as a switch or remote concentrators in a DSA communications network. A single DATANET 8 can perform all three functions—front-end processor, switch, and remote concentrator—concurrently.

The DATANET 8 processor series includes the DATANET 8/10, 8/20, and 8/30. All three network processors are expandable from a basic to maximum configuration and use the same executive software, DNS.

DATANET 8/10 is a single-processor system which provides support for a maximum of 31 data communications lines. A 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, Line Interface Module, and Multi-Line Controllers with associated options make it possible to expand data communications ports to a maximum of 31 lines. These options accommodate line characteristics such

Honeywell Bull DPS 90 Series

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	2,000	2,000	2,000	2,000	2,000, 3,300	2,000, 3,300
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

as data transmission speed, asynchronous/synchronous operation, and physical interfaces such as RS-232-C.

DATANET 8/20 is a single-processor system with cache memory and 1 megabyte of central memory. To increase 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. The basic 8/20 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 Multi-Line Communications Controllers and associated 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.

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. Multi-Line Communications Controllers and associated 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.

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 co-exist 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 all three 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 of 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 of 19.2K bps.
- 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:

- RS232-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 of 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-

Honeywell Bull DPS 90 Series

► foot cable (DCE to DTE) for device attachment, and has a maximum transmission speed of 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 of 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 of 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 of 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 of 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 of 64K bps.

SOFTWARE

OPERATING SYSTEM: GCOS 8 Software Release 3000 (SR3000) is the latest version of the company's primary operating system for large-scale mainframes. Included in the new release is support for relational data management software, improved transaction processing, and larger capacity disk drives. Additionally, SR3000 includes the Rapid Access Data System (RADS), a feature for improving system throughput. Through RADS, users can access a larger percentage of data held in a special section of main memory, rather than disk memory, to improve response times, particularly in interactive environments. In addition to GCOS 8, DPS 90 mainframes also operate under the Control Program (CP) 6 operating system without modification to hardware.

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

processing systems into a single logical network system regardless of physical boundaries.

With the introduction of the DPS 8000, Honeywell Bull announced Integrated Information Architecture, which divides Honeywell Bull systems into three different operating levels—the enterprise level at the top of a computing organization, departmental level at the middle, and workstation level at the bottom. Users can access information pertinent to an entire organization at the enterprise level. Data that serves the specialized needs of separate groups within an organization resides at the departmental level. Workstation-level processing meets the informational needs of individuals. Each level can be interconnected in two or three tiers to meet specific user requirements.

GCOS 8 SR3000 is offered for all Honeywell large-scale processor lines from the DPS 8, DPS 8000, and DPS 88 to the top-end DPS 90. Migration to the new release from Release 2500, the former GCOS 8 version, can be accomplished without recompiling application software. Generally, applications written for GCOS 8 can run without modification on any Honeywell Bull large system running GCOS 8.

GCOS 8 is a user-defined and user-oriented virtual operating system, with multidimensional capabilities. 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 batch processing, remote job entry (RJE), interactive remote job entry (IRJE), timesharing, transaction processing, direct program access, on-line test and diagnostics, on-line program test and development, and decision support for end users.

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

GCOS 8 features hardware transparency, meaning that the user has no need to know the particular architecture of the system, its hardware, I/O devices, or processor types. All processors can access all of memory and can execute any program. GCOS 8 can address up to 256 megabytes of real memory. Up to 477 user programs can be executed concurrently. GCOS 8 can use up to 256 megabytes of real memory for all dimensions. It provides high throughput with efficient and rapid scheduling of all activities, reducing operator intervention.

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

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

Honeywell Bull DPS 90 Series

- ▶ GCOS 8 controls the physical organization of up to 512 work spaces of up to 4 million pages of virtual storage each, with each page consisting of 4096 bytes. Up to 477 separate working spaces (out of 512 total working spaces) are available for user processes.

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

Hardware and software system security is provided in several ways. Software controls include logon, application access, and data access. Hardware security mechanisms include virtual memory with domains, working spaces, segments and pages along with three central processor modes, privileged master, master, and slave. (For a description of operating modes, please refer to the hardware section of CHARACTERISTICS.)

The GCOS operating system itself and user and systems programs are protected by a domain structure. A domain is a set of noncontiguous segments in one or more working spaces. Domains put boundaries around certain parts of the operating system, protecting them from unauthorized access. The programmer and site administrator decide which segments will be available to a subprogram. The domains prohibit a subprogram from accessing segments that it has no need to access and from affecting anything outside its domain.

System access to a GCOS host begins with the GCOS 8 network interface module (DNET/ROUT), which routes terminal access to the requested subsystem. Available subsystems include Infoedge/Interrel, TP 8, DM-IV/TP, TDS, TPE, TSS, Sysout, or any user-implemented subsystem within a direct access or interactive interface. Each system has its own logon interface. Logon procedures vary greatly among subsystems; the need to supply user identification and password, however, is common to all subsystems. Interrel, the Honeywell Bull relational data base management system, includes an ANSI-standard Information Resource Dictionary System (IRDS) which controls relational data access. IRDS includes user profiles which specify a user's access privileges. It also provides fine grain control to data fields to a minimum of one character.

File Management Supervisor (FMS) is the other major component of data access software. A file catalog and space manager, FMS groups files and subcatalogs in hierarchical structure by user name, access restrictions, and resource control. A system master catalog entry lists all authorized users for the installation.

Each subsystem has a master user defined for administrative purposes. The master user console is typically a terminal connected via the front-end network processor.

PROGRAMMING LANGUAGES: Language processors available for use on the DPS 90 systems under GCOS 8 are Ada, APL, Basic, C, Cobol 74, Cobol 85, Fortran-77 ESV (DPS 90 and DPS 8000 only), Fortran 77, GPSS, GMAP, Lisp, PL/1, Pascal, and RPG II.

DATA BASE MANAGEMENT: With the release of SR3000, Honeywell Bull brought out Interrel, an integrated relational data management system. The Interrel data manager can access the new relational file type and also provide relational access to nonrelational files and data bases. The facility accomplishes this without restructuring data

files or programs. (For more information about Interrel, please refer to the next section.)

In addition to Interrel, Honeywell Bull continues to offer Data Management-IV (DM-IV) Data Base Manager, a CODASYL-style product which handles data base management functions on Honeywell Bull mainframes. The Data Base Manager, also referred to as Integrated Data Store/II (I-D-S/II), administers the creation of the physical and logical structures of the data base and controls the creation of the application-specific views of that data base used in processing. Further, it serves as the interface between the data base and the various DM-IV processors that access the data base and perform operations upon it.

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

DATA MANAGEMENT: Data management on Honeywell Bull large systems is handled through the Interrel Integrated Relational Data Management System (IRDS) and through DM-IV.

Interrel is an integrated relational data base management product. Interrel includes Structured Query Language (SQL) and the Information Resource Dictionary System (IRDS), both conforming to ANSI standards. Interrel's implementation of SQL is compatible with IBM's SQL/DS and DB2, Oracle from Oracle Corporation, Ingres from Relational Technology Inc., and the Teradata DBC/1012 data base computer. Interrel's SQL language accesses both nonrelational and relational data bases.

The Interrel SQL uses English-like commands to create, update, or delete tables or authorize access for system users. Interrel automatically creates table definition and data base table space, establishes the necessary controlling information, and deposits this information in the IRDS central dictionary.

Interrel accesses storage data through the Data Manager. Using this component, full relational files can be added to existing nonrelational models, and information can be merged through SQL. This functionality provides users with a seamless interface from third-generation data base technologies to newer fourth-generation technologies and allows users to migrate to relational data base functions without the need to duplicate information through copy management.

Also available on Honeywell Bull systems is DM-IV, a product containing a collection of facilities to handle data base management, transaction processing, querying, and report processing, in addition to providing batch and interactive data base capabilities. Other facilities under data management include the Data Dictionary/Directory System (DD/DS), File Management Supervisor, Unified File Access System (UFAS), and Common Files Facility (CFF).

DM-IV has evolved from earlier software systems such as Integrated Data Store-I, Transaction Processing System, Transaction Driven System, and Management Data Query System. DM-IV is a fully operational, on-line, integrated data base management system. Data extraction and updating from data bases with various file organizations and data structures can be performed by non-data processing professionals. DM-IV consists of the following functional modules: the Data Manager (described in the DATA BASE MANAGEMENT section), the Transaction Proces-

Honeywell Bull DPS 90 Series

► sor, the Query and Reporting Processor, and the Procedural Language Processor. It also supports batch and timesharing programs.

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

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

The *DM-IV Query and Reporting Processor (QRP)* provides the user with several 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 *File Management Supervisor (FMS)* provides powerful file management capabilities, including multilevel user catalogs, file sharing, and access control. The system employs a hierarchical, "tree-structured" design. A System Master Catalog lists the various user Master Catalogs, and each user may, in turn, define one or more levels of subcatalogs. Users may permit general sharing of their files or specify individual users who may have access to 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 timesharing command allowing a user to encrypt his or her file using a predefined algorithm.

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

The *Common Files Facility (CFF)* controls the sharing of user program and data files between GCOS III and GCOS 8 as well as between GCOS 8 hosts without requiring manual partitioning of data or mass storage devices. The CFF allows a DPS 8, DPS 8000, DPS 88, and DPS 90 system(s) to share disk files on a single common group of disk drives.

CFF allows up to four computer systems to share common disk drives. Concurrent access to files is controlled by lock bytes in the mass storage processor that supervises disk drive operation. Locking occurs at the single file level, which ensures that only one computer system in the cluster

can update a file at one time. CFF clusters can also exist within communications networks based on Honeywell Bull's DSA.

DATA COMMUNICATIONS: *Distributed Network Supervisor (DNS)* has been designed specifically for use in the DATANET 8 Processor and is part of a set of communications software products based on Honeywell Bull's Distributed Systems Architecture (DSA). DNS supports up to four DPS 90 Host connections enabling one DATANET 8 to serve multiple hosts.

DNS operates in the DATANET 8 in conjunction with a GCOS 8-based host to provide support for transaction processing, distributed transaction processing, distributed terminal concentration, timesharing, remote job entry, direct program access, and networks made up of DPS 90, DPS 88, DPS 8000, DPS 8, DPS 7, DPS 7000, and DPS 6 systems in any combination. DNS supports private networks; Public Data Networks (PDNs); and Value-Added Networks (VANs), including X.25 packet switched and X.21 circuit switched networks.

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

DNS supports a variety of Honeywell Bull terminals and also supports the DPS 6-DSA software package that allows a DPS 6 or Level 6 system to function as a distributed processor and to communicate with a DPS 90 host in a DSA network.

The *Network Processing Supervisor (NPS)* and the DPS 90 support five types of remote processing in any combination: remote job entry (RJE), transaction processing, timesharing, message switching, and direct program access. RJE is supported by four standard interfaces for remote computers: remote computer interface, remote network processor multimessage interface, BSC interface, and HDLC interface.

The information network is controlled by DATANET Front-end Network Processors 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 variety of remote terminals, computers, and communications facilities from Honeywell Bull and other vendors. NPS can also be customized to support integration of additional terminal types and network protocols into the system, journalization of message traffic on mass storage, restart/recovery capability, supervisory control through one or more Network Control Supervisory Stations, statistical recording and reporting, and a high level of line/terminal control through parameterization.

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

GRTS-II includes a *Communication On-Line Test System (COLTS)* and support for remote terminals and devices ►

Honeywell Bull DPS 90 Series

▶ with speeds from 75 to 56,000 bps. GRTS-II may coexist with NPS or DNS, each residing and executing in a different network processor. Host-to-host file transmission is supported through the Data Link System.

Transaction Processor 8 (TP8) is Honeywell Bull's newest transaction processing product. TP8 is particularly suited to heavy transaction processing work loads and contains features that make it compatible with all earlier GCOS transaction processing products, including DM-IV/TP, TPE II, TDS, and TPE. This compatibility helps preserve a user's information investment while offering a natural growth path for increased performance and functionality.

TP8 provides an on-line, realtime system and, through DSA session control, interfaces with a logical network that is independent of the physical topology of the communications network. TP8 is a native-mode transaction processor designed to take advantage of the features of both GCOS 8 and DSA. Both DSA and pre-DSA networks are supported. System resources can be partitioned to a logical application level.

Several major services traditionally associated with transaction processing executives, such as integrity control, memory management, buffer management, and journalization, have been integrated into the GCOS 8 operating system software layer known as shared software. These services are used by the various environments of GCOS8/TP8 as well as batch and other transaction processors. As a part of shared systems service software, TP8 can help reduce memory requirements because only one copy of the executive software is necessary for all native users.

TP8 can also take better advantage of multiple central processors, allowing parallel execution of application routines. Applications can be implemented through routines and programs written in several languages including Cobol 74 or Fortran. While in execution, each routine or program is processed independently and can access the range of facilities available in GCOS 8.

The DM-IV Transaction Processor (TP) is the older Honeywell Bull product currently in wide use with GCOS 8 systems. DM-IV/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 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, Database 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 communications between application routines.

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

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

The *Message Manager* is the executive software component that actually handles the communications interface with the terminal network supported by the Front-end Network Processor. 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.

Supporting tools for both TP8 and DM-IV/TP include Transaction Application Test System (TATS) and Transaction Screen Management System (TSM). TATS is a software tool that provides an interactive timesharing environment for writing, compiling, testing, and debugging Transaction Processing Routines (TPRs) using a DM-IV (IDS-II) data base. TATS also provides a TPR program skeleton generator, and forms mode support is currently provided for the TP8 or DM-IV TP Forms Option (TPFO). The TATS package can also be used to interactively verify data base updates and to integrate completed TPRs into the production system.

TSM is a set of tools designed to enhance the development of application programs in a TP8 or DM-IV TP environment. This system enables the developer to design, develop, test, and implement screen formats for application systems. Little or no knowledge of the communications network or the TP8 or DM-IV TP operating environment is required.

Personal Computer Interconnect (PCI) is a new generation of personal computer/host access software. PCI executes as an application layer on MS-DOS-based personal computers. The product supports Honeywell Bull MicroSystem PC (AP and XP), IBM PC/AT/XT, and true IBM compatibles. PCI allows PC users to access host-based data and to transfer data to a PC and provides a state-of-the-art person/machine interface. Users can operate a pointing device (mouse or trackball) to point at pop-up menus and icons representing file drawers, folders, and applications. By depressing a button on the pointing device, the files in a drawer are presented or the contents of a folder can be examined or executed. Because operations are controlled by the mouse, users are not required to remember file strings or learn command sequences. Even host-based commands and file names can be handled in this manner at the user's discretion. All operations can also be controlled from the keyboard. Windows appearing on the screen give users access to various processes concurrently, allowing the user to manage several operations at once. These can include spreadsheets, host query, and data conversion.

Features supported under PCI include auto logon, window manager, graphics controller, VIP terminal emulation, file transfer, script processing, and optional encryption and decryption of files. PCI can work with Lotus 1-2-3, dBASE III Plus, Multimate Advantage, WordStar Professional, ChartMaster, Spreadsheet Auditor, GEM, Bridge, and One Shot.

The *TimeSharing System (TSS)*, in connection with a DATANET front-end processor, provides time-sharing computing services to multiple users at remote terminals. System resources allocated to timesharing can be dynamically varied under operator control. The timesharing executive, operating as a subexecutive under GCOS 8, suballocates storage and dispatches the processor to the programs of individual timesharing users. Timesharing on GCOS 8 utilizes the GCOS 8 memory architecture to permit any desired amount

Honeywell Bull DPS 90 Series

► of system memory to be allocated to timesharing. A single copy of TSS can support up to 600 users, assuming sufficient memory, I/O, and communications facilities are provided. In multiple-processor systems, the timesharing users' programs can simultaneously use as many processors as necessary. A separately priced Multicopy Support Option allows from two to four copies of the timesharing executive to run on one GCOS 8 system, thereby increasing the number of users that can be supported.

GCOS timesharing users have a choice of six major programming languages: Cobol-74, Extended Basic, Pascal, TimeSharing Fortran-66, Fortran-77, and APL. Timesharing 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.

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 TimeSharing Activity Report provides reports on the accumulated utilization of the timesharing system resources.

PROGRAM DEVELOPMENT: Honeywell Bull offers a number of products that users can employ as program development tools. These include the Text Executive Processor (TEX); Edit8, the full-/split-screen editor; the Transaction Application Test System (TATS); the Transaction Screen Management System (TSM); System-80, the applications generator; MAGNA 8, the fourth-generation language; and others described in the following paragraphs. TATS and TSM were described in the DATA COMMUNICATIONS section.

The *Text Executive Processor* permits terminal users to create a body of text, edit, save, 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.

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

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

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

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

The *Debug Support System (DSS)* supports batch or on-line debugging of user programs and can trace programs, display memory contents, and modify memory locations. Object-level debug can be performed with any language. Symbolic debug is supported by Cobol-85, Cobol-74, Fortran-77, and PL/1.

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

OTHER SOFTWARE: With the introduction of GCOS 8 SR3000, Honeywell Bull released Infoedge, a new family of end-user productivity products supported by the Interel integrated relational data base management system. (Interel is described in the Data Management section.) Infoedge contains a set of productivity tools for experienced data processing professionals, technical end users, and non-data processing professionals. The product contains integrated facilities which end users can access through terminals and professional workstations. The product includes a spreadsheet, a forms generator, and a global menu system. Infoedge features include Infoedge-Menu Services, which provide a consistent menu selection regardless of terminal or workstation type, system, function set, or user sophistication. Menu selections include the Resource Dictionary Services, which allow access to the Information Resource Dictionary System within Interel.

Infoedge-Personal Computing, a facility which interfaces with Interel, lets users create and maintain forms. The facility allows users to define forms with variable text and results fields. It also supports data storage and retrieval functions, math and logic functions, editing and graphics, and an on-line HELP facility.

Options available with Infoedge include decision-support services, query facilities, and workstation facilities. Decision-support facilities include Infoedge-Graph for interactive facilities and Infoedge-Financial Planner for financial modeling and business planning. Query Facilities include Example Query, an end-user request facility, and Reporter, a facility for formatting data obtained from Example Query and SQL into report form. Workstation facilities include Infoedge-Mail, a distributed electronic message facility, and Infoedge-Meetings, a facility that permits authorized users to attend "meetings" through a terminal device.

PRICING and SUPPORT

POLICY: DPS 90 equipment is available for purchase or for rental under a one-year or four-year lease.

SUPPORT: Honeywell Bull offers several maintenance plans falling under basic hardware maintenance, extended maintenance coverage, and premium services. Basic monthly hardware maintenance provides contracted on-call remedial maintenance service during the Principal Period of Maintenance (PPM). PPM covers a period between 8 a.m. and 6 p.m., Monday through Friday, excluding locally observed Honeywell Bull holidays. Basic service includes toll-free access to the National Response Center, 24 hours a day, seven days a week, and remote mainframe maintenance access. Other features include the services of specialist personnel from the Technical Assistance Center, Customer Service Engineer visits when necessary, and remedial and preventive maintenance services.

Extended Maintenance service provides coverage for hours outside the PPM. Under this coverage plan, the user pays ►

Honeywell Bull DPS 90 Series

► an additional charge which is a fixed percentage of the base maintenance charge. The percentage varies by day and number of extended hours beyond the regular maintenance period. Customers requesting service outside the PPM will be billed at published contract-customer hourly rates. The current rate is \$159 per hour for all times Monday through Sunday. Customers who do not have a maintenance contract will be billed at a time and materials rate of \$185 per hour for a minimum of four hours.

Premium service provides maintenance coverage on a 24-hour-per-day, seven-day-per-week basis. Coverage includes guaranteed response time credits, preventive maintenance, equipment installation, field change order installation, and equipment malfunction protection credits.

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

	Hourly Rates (\$)	Monthly Rates (\$)
Principal or senior technical consultant	138	19,174
Project supervisor or technical consultant	112	15,653
Technical specialist	100	14,088
Systems analyst/senior programmer	85	11,739
Programmer	59	8,218

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

GCOS 8 is delivered as two separate products. The Basic System is licensed at no separate charge to customers who acquired their central systems from Honeywell Bull and for a separate license fee to customers who acquired their central systems from sources other than Honeywell Bull. The GCOS Executive is separately licensed for the same tiered fee to all customers regardless of how they acquired their central system. 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.

The Honeywell Bull TotalCare Software Services program provides users with a variety of standard and customized software support services ranging from onetime installation of operating system software to ongoing site management. Ongoing support is part of Basic and Expanded Services. Basic Support gives users access to Honeywell Bull's National Response Center through a toll-free number 24 hours per day, seven days per week. A software specialist at a Honeywell Bull Technical Assistance Center then tries to solve the problem. Expanded Service features on-site support in addition to on-line diagnostic facilities. Customized programs include start-up services, system techniques for on-site management, supplemental services, and system

services. TotalCare charges include some fixed pricing based on the amount of software a company uses. Other charges are quoted individually, depending on the site and specific needs.

EDUCATION: Education services include standard courses, advanced professional training, multimedia self-instruction courses permitting 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: The following illustrates possible configurations for DPS 90 systems. These configuration samples do not include software.

SMALL CONFIGURATION:

DPS 90/91 Single Processor Complex includes one CPU, one Input/Output Processor with four high-speed channels, one Main Memory Unit with 32MB, one System Control Unit, one Power Supply Unit, one System Control Center, and one Interface Adapter Unit	\$3,550,000
Two MXF8913 High-Speed Channels	16,000
One MXF8915 Low-Speed Channel	8,000
Four MXF8916 Data Streaming Channels	32,000
One MXF8921 IAU Channel Expansion; 9 to 16 channels	2,800
MXF8923 IAU Power Expansion	5,200
One MXF8927 IAU Power Sequencing	3,200
One MXF8928 IAU Power Sequencing Expansion	2,600
Two MSP3881 Mass Storage Processors	150,540
Four MSU3380 Head of String Mass Storage Units (1.8GB per unit)	355,200
12 MSU3382 Slave Units (1.8GB per unit)	773,400
Two MTS8218 Magnetic Tape Subsystems	89,600
Two MTF8201 Cross Bar Switches (2 by 8)	12,260
12 MTU8208 Tape Units (200 ips)	252,200
One URP8901 Unit Record Processor	20,000
Two PRU0908 printers (900 lpm)	69,950
Two PRU1208 printers (1,200 lpm)	76,550
One DCE8111 DPS 90 Network Processor Connection	8,000
One DCU8130 DATANET 8/30	80,000
One DCM8130 DATANET 8/30 2MB Memory Expansion	14,000
One DCF8002 Console Display	795
Two MGS8801 Motor Generators	76,000
MGF8901 Motor Generator Sequencing	4,000
PSS8900 Power Sequencing	4,000
TOTAL PURCHASE PRICE:	\$5,606,095

Honeywell Bull DPS 90 Series



MEDIUM CONFIGURATION

DPS 90/92 Dual Complex includes two Central Processing Units, one Input/Output Processor with four high-speed channel processors, one Main Memory Unit with 32MB, one System Control Unit, one Power Supply Unit, one System Control Center, and one Interface Adapter Unit (IAU)	\$4,500,000
CMM8932 Memory Module; additional 32MB	360,000
Two MXF8913 High-Speed Channels	16,000
One MXF8915 Low-Speed Channel	8,000
Four MXF8916 Data Streaming Channels	32,000
One MXF8921 IAU Channel Expansion; 9 to 16 channels	2,800
MXF8923 IAU Power Expansion	5,200
One MXF8927 IAU Power Sequencing	3,200
One MXF8928 IAU Power Sequencing Expansion	2,600
Two MSP3881 Mass Storage Processors	150,540
Four MSU3380 Head-of-String Mass Storage Units (1.8GB per unit)	355,200
12 MSU3382 Slave Units (1.8GB per unit)	773,400
Two MTS8218 Magnetic Tape Subsystems	89,600
Two MTF8201 Cross Bar Switches (2 by 8)	12,260
12 MTU8208 Tape Units (200 ips)	252,000
One URP8901 Unit Record Processor	20,000
Four PRU1208 printers (1,200 lpm)	153,100
Two DCE8111 DPS 90 Network Processor Connections	16,000
One DCU8120 DATANET 8/20	38,000
One DCU8130 DATANET 8/30	80,000
One DCM8130 DATANET 8/30 2MB Memory Expansion	14,000
Two DCF8002 Console Displays	1,590
Two MGS8801 Motor Generators	76,000
MGF8901 Motor Generator Sequencing	4,000
PSS8900 Power Sequencing	4,000
TOTAL PURCHASE PRICE:	\$6,969,490

LARGE CONFIGURATION

DPS 90/94 Quad Complex includes four CPUs, four Input/Output Processors, each with four high-speed channel processors, two Main Memory Units with 64MB total main memory, two System Control Units, two Power Supply Units, two System Control Centers, and two Interface Adapter Units	\$7,600,000
Two CMM8932 Memory Modules; additional 64MB	720,000
Two MXF8913 High-Speed Channels	16,000
One MXF8915 Low-Speed Channel	8,000
Four MXF8916 Data Streaming Channels	32,000
One MXF8921 IAU Channel Expansion; 9 to 16 channels	2,800
MXF8923 IAU Power Expansion	5,200
MXF8927 IAU Power Sequencing	3,200
One MXF8928 IAU Power Sequencing Expansion	2,600
Two MSP3881 Mass Storage Processors	150,540
Two MSU3381 Head-of-String Mass Storage Units (3.6GB per unit)	245,000
Six MSU3383 Slave Units (3.6GB per unit)	588,900
Two MTS8218 Magnetic Tape Subsystems	89,600
Two MTF8201 Cross Bar Switches (2 by 8)	12,260
Twelve MTU8208 Tape Units (200 ips)	252,000
URP8901 Unit Record Processor	20,000
Four PRU1208 printers (1,200 lpm)	153,100
Two DCE8111 DPS 90 Network Processor Connections	16,000
One DCU8120 DATANET 8/20	38,000
One DCU8130 DATANET 8/30	80,000
One DCM8130 DATANET 8/30 2MB Memory Expansion	14,000
Two DCF8002 Console Displays	1,590
Two MGS8801 Motor Generators	76,000
MGF8901 Motor Generator Sequencing	4,000
PSS8900 Power Sequencing	4,000
TOTAL PURCHASE PRICE:	\$10,134,790

EQUIPMENT PRICES

		Purchase Price (\$)	Monthly Maint. (\$)	1-Year Lease (\$)	4-Year Lease (\$)
PROCESSORS					
CPS8990	DPS 90/91 Central System includes a single CPU and 32 megabytes of main memory, an Input/Output Processor (IOP) with 16 channels, a System Control Unit (SCU), a System Control Center (SCC), and a Service Processor (SP)	3,550,000	5,625	246,875	183,721
CPS8992	DPS 90/92 Central System includes two CPUs and 32 megabytes of main memory, an IOP with 16 channels, an SCU, an SCC, and an SP	4,500,000	6,750	312,500	232,558
CPS8996	DPS 90/92T fully redundant version contains two of each central system components, 64 megabytes of main memory, and two IOPs with 32 channels	5,625,000	8,325	390,625	290,698
CPS8993	DPS 90/93 Central System includes three CPUs and 64 megabytes of main memory, three IOPs with 48 channels, two SCUs, two SCCs, and two SPs	6,500,000	9,450	456,250	339,535
CPS8994	DPS 90/94 Central System includes four CPUs and 64 megabytes of main memory, four IOPs with 64 channels, two SCUs, two SCCs, and two SPs	7,600,000	10,575	521,875	388,372

NA—Not available.
NC—No charge.



Honeywell Bull DPS 90 Series



		Purchase Price (\$)	Monthly Maint. (\$)	1-Year Lease (\$)	4-Year Lease (\$)
ADDITIONAL MEMORY					
CMM8932	Additional 32-megabyte memory module	360,000	720	25,000	18,605
SYSTEM UPGRADES					
CPK8991	DPS 90/91 to DPS 90/92	1,100,000	855	75,000	55,814
CPK8992	DPS 90/92 to DPS 90/93	1,800,000	2,430	125,000	93,023
CPK8993	DPS 90/93 to DPS 90/94	1,000,000	855	62,500	46,512
CPK8996	DPS 90/92 to DPS 90/92T	855,000	1,305	59,375	44,186
CPK8997	DPS 90/92T to DPS 90/93	1,000,000	855	62,500	46,512
CPK8981	DPS 90/91 to DPS 90/92 with second IOP	1,300,000	1,125	96,875	72,093
CPK8982	DPS 90/92 to DPS 90/93 with second and third IOP	2,115,000	2,700	146,875	109,302
CPK8983	DPS 90/93 to DPS 90/94 with fourth IOP	1,300,000	1,125	81,250	60,465
CPK8984	DPS 90/92 to DPS 90/92T with second IOP	1,200,000	1,575	81,250	60,465
CPK8985	DPS 90/92T to DPS 90/93 with third IOP	1,300,000	1,125	81,250	60,465
CHANNEL OPTIONS					
MXU8902	Additional IOP with four high-speed channel processors	450,000	270	31,250	23,256
MXF8903	Exchange Feature; high-speed channel	5,000	NA	156	116
MXF8904	Exchange Feature; network processor channel	6,500	NA	94	70
MXF8905	Exchange Feature; low-speed channel	5,000	NA	156	116
MXF8906	Exchange Feature; data streaming channel	12,500	NA	156	116
MXF8909	Exchange Feature; Federal Information Processing Standard tape channel	12,500	NA	156	116
MXF8913	High-speed channel attachment feature	8,000	12	500	372
MXF8914	Network processor attachment feature	8,000	12	500	372
MXF8915	Low-speed attachment feature	8,000	12	500	372
MXF8916	Data streaming channel attachment feature	8,000	12	500	372
INTERFACE ADAPTER UNIT AND OPTIONS					
MXU8910	Basic Interface Adapter Unit (IAU); supports up to 7 General Purpose Adapter (GPA) channels	52,650	150	3,291	2,449
MXF8921	Channel expansion for MXU8910; provides support for 8 to 14 GPA channels	2,800	10	175	130
MXF8923	Power Expansion for MXU8910	5,200	5	325	242
MXF8927	Power Sequencer for MXU8910; 1 to 7 GPA channels	3,200	5	200	149
MXF8928	Power Sequencer Expansion for MXU8910; 9 to 16 GPA channels	2,600	5	162	121
MXF8023	GPA for tape	18,500	15	850	700
MXF8024	GPA for disk	18,500	15	850	700
POWER OPTIONS					
MGS8801	Motor Generator and Control; 62.5 kVA, 60 Hz, 208/240 V AC or 440/480 V AC input, three-second ride-through	38,000	70	1,280	1,025
MGF8901	Motor Generator Sequencing for MGS8801	4,000	2	250	186
PSS8900	Power Sequencing	4,000	5	250	186
MASS STORAGE SUBSYSTEM					
Processors and Features					
MSP3881	Mass Storage Processor includes two storage directors and two attachment channels; requires two MSF8916 connections	75,270	202	4,460	3,795
MSP3885	Mass Storage Processor includes two storage directors and four attachment channels; requires four MSF8916 connections	90,270	226	5,350	4,550
MSP8021	Freestanding Primary Single-Channel Mass Storage Processor, which includes first MSU addressing feature; requires one channel connection feature	39,000	110	2,311	1,965
MSP8022	Integrated Secondary Single-Channel Mass Storage Processor; requires MSP8021 as a prerequisite and one primary disk channel connection	29,000	82	1,720	1,460
MSP8023	Integrated Secondary Single-Channel Mass Storage Processor; requires MTP8021 as a prerequisite and one primary disk channel connection	32,000	90	1,900	1,615
MSF8021	Dual Channel Option for MSP8021 and MSP8023; requires one primary disk channel connection	16,300	54	965	820
MSF8022	Dual Channel Option for MSP8022; requires one primary disk channel connection	16,300	54	965	820
MSA8011	Addressing capability for four MSU0451s or for two MSU0500/0501s	NC	NC	NC	NC
MSF8018	Primary Disk Channel Connection to DPS 90 high-speed channel for mass storage processor or dual-channel option.	3,500	6	175	145
MSF8019	Switched Disk Channel Connection for DPS 90 high-speed channel for mass storage processor or dual-channel option.	4,600	7	230	195
MSF3881	MSP3881 upgrade to MSP3885; requires two MXF8916 connections	16,000	26	890	755
MSK0501	Upgrade Kit; MSU0500 to MSU0501	5,000	25	361	297
MSK0502	Upgrade Kit; MSF0500 to MSF0501 Head-Disk Assembly	3,468	NA	NA	NA
MSF0011	MSU0501 Dual-Access Feature	4,140	23	163	136
MSF0501	Additional Head-Disk Assembly for MSU0501	15,808	NA	NA	NA

NA—Not available.

NC—No charge.



Honeywell Bull DPS 90 Series

Disk Drives		Purchase Price (\$)	Monthly Maint. (\$)	1-Year Lease (\$)	4-Year Lease (\$)
MSU3380	Head-of-String Mass Storage Disk Unit includes a built-in controller and two HDAs; 1.8 gigabytes of capacity	88,800	295	4,780	4,070
MSU3381	Mass Storage Disk Unit; 3.6 gigabytes of formatted capacity	122,500	NA	7,100	6,500
MSU3382	Slave Mass Storage Disk Unit includes two HDAs and attaches to MSU3380; 1.8 gigabytes of capacity	64,450	215	3,470	2,960
MSU3383	Mass Storage Disk; 1.8 gigabytes of formatted capacity	98,150	NA	5,750	5,200
MSU0451	Removable Disk Mass Storage Unit; 200-megabyte capacity	18,500	122	1,140	950
MSF0006	Dual-Access Feature for MSU0451	2,070	14	89	76
MSF0007	Remote Position Sensing Option for MSU0451; one required for each disk unit	500	14	87	76
MSU0500	Dual-Fixed Disk Mass Storage Unit; 626-megabyte capacity, formatted	38,850	198	1,412	1,180
MSU0501	Dual-Fixed Disk Mass Storage Unit; 1101-megabyte capacity, formatted	43,850	227	1,777	1,482
MSK0501	Upgrade kit; MSU0500 to MSU0501	5,000	25	361	297

MAGNETIC TAPE SUBSYSTEM

MTP8021	Freestanding Primary Magnetic Tape Processor; includes 1600-/6250-bit per inch (bpi) capability and first magnetic tape unit addressing feature, and supports up to eight tape units; requires one channel connection feature	29,000	180	1,620	1,355
MTP8022	Integrated Secondary Magnetic Tape Processor; includes 1600-/6250-bpi capability and supports up to eight tape units; requires one primary tape channel connection	29,000	180	1,620	1,355
MTP8023	Integrated Secondary Magnetic Tape Processor; includes 1600-/6250-bpi capability and supports up to eight tape units; requires one primary tape channel connection	22,000	137	1,230	1,030
MTU0610	Magnetic Tape Unit; includes cartridge load	21,000	188	814	690
MTU0630	Magnetic Tape Unit	14,815	161	604	516

MTS8200 Subsystems

MTS8205	Magnetic Tape Subsystem includes tape processor, one MTU8205 tape unit; FIPS compliant	48,000	410	2,913	2,516
MTS8206	Magnetic Tape Subsystem includes tape processor, one MTU8206 tape unit; FIPS compliant	45,000	410	2,774	2,395
MTS8208	Magnetic Tape Subsystem includes tape processor, one MTU8208 tape unit; FIPS compliant	47,000	515	2,876	2,484
MTS8215	Magnetic Tape Subsystem includes tape processor, one MTU8205 tape unit; FIPS compliant	45,800	410	2,913	2,516
MTS8216	Magnetic Tape Subsystem includes tape processor, one MTU8206 tape unit; FIPS compliant	42,800	410	2,774	2,395
MTS8218	Magnetic Tape Subsystem includes tape processor, one MTU8208 tape unit; FIPS compliant	44,800	515	2,876	2,484
MTF8200	1 x 8 Switch	NC	NC	NC	NC
MTF8201	2 x 8 Switch	6,130	14	323	279
MTF8204	Magnetic Tape Subsystem Switched Channel	8,000	12	421	364
MTK8211	Altitude Adapter	NC	NC	NC	NC
MTU8205	Magnetic Tape Unit; 800/1600 bpi, 125 inches per second (ips)	19,050	240	1,038	897
MTU8206	Magnetic Tape Unit; 1600/6250 bpi, 125 ips	18,500	240	1,061	916
MTU8208	Magnetic Tape Unit; 1600/6250 bpi, 200 ips	21,000	342	1,163	1,005

Features for the MTU0610

MTF0607	800/1600 bpi, 200 ips feature for MTU0610	6,090	81	306	266
MTF0608	1600/6250 bpi, 200 ips feature for MTU0610	13,319	124	520	441
MTK0678	Upgrade Kit; MTF0607 to MTF0608 performance	10,784	52	215	176

Features for the MTU0630

MTF0634	75 ips, PE/NRZI feature	4,725	151	297	268
MTF0635	75 ips, PE/GCR feature	7,110	129	351	309
MTF0636	125 ips, PE/NRZI feature	9,805	170	472	410
MTF0637	125 ips, PE/GCR feature	10,330	148	470	408
MTK0630	Performance upgrade MTF0634 to MTF0635	2,385	21	76	61
MTK0631	Performance upgrade MTF0636 to MTF0637	1,700	27	57	47
MTK0632	Performance upgrade MTF0634 to MTF0636	5,080	21	176	146
MTK0633	Performance upgrade MTF0635 to MTF0637	3,220	21	121	101
MTK0634	High Altitude Adapter	240	NA	8	6

PRINTERS

PRU908	High-Speed Belt Printer; 900 lines per minute (lpm)	34,975	453	2,097	1,752
PRU1208	High-Speed Belt Printer; 1,200 lpm	38,275	503	2,375	1,955
PRU1600	High-Speed Belt Printer; 1,600 lpm, 136 print positions	64,940	538	2,910	2,472

NA—Not available.
NC—No charge.

Honeywell Bull DPS 90 Series

		Purchase Price (\$)	Monthly Maint. (\$)	1-Year Lease (\$)	4-Year Lease (\$)
PRU0908/1208 Options					
PRB3213	64-character Uppercase ASCII Print Belt, optimized	NC	NC	NC	NC
PRB3300	96-character Upper/Lowercase ASCII Print Belt, optimized	NC	NC	NC	NC
PRB3500	64-character Series 400/600/6000/L66 Print Belt	NC	NC	NC	NC
PRB3501	64-character Standard IBM Print Belt	NC	NC	NC	NC
PRB3513	64-character Uppercase ASCII Print Belt	NC	NC	NC	NC
PRB3524	64-character OCR-A Numeric Print Belt	NC	NC	NC	NC
PRB3549	64-character OCR-A Alphanumeric Print Belt	NC	NC	NC	NC
PRB3600	96-character Upper/Lowercase ASCII Print Belt	NC	NC	NC	NC
PRB3703	64-character Series 200/2000 Print Belt	NC	NC	NC	NC
PRK0903	Upgrade PRU908 to PRU1208	5,000	54	304	229
PRU1600 Options					
PRB0500	63-character OCR-B Print Belt	2,460	97	186	171
PRB0524	63-character OCR A/B Print Belt	2,460	97	186	171
PRB0532	63-character Puerto Rico Print Belt	2,460	101	186	171
PRB0549	63-character OCR-A Alphanumeric Print Belt	2,460	97	186	171
PRB0600	94-character ASCII Belt; upper-/lowercase	2,567	97	191	173
PRF0022	24 additional print positions; 136 to 160	2,610	17	113	94
PUNCH CARD EQUIPMENT					
URP8901	DPS 90 Unit Record Processor; supports up to four devices	20,000	30	1,250	930
CRU0501	Card Reader; 500 cards per minute	19,500	129	694	578
TERMINALS					
HDS7403	Asynchronous Terminal with 14-inch CRT, green phosphor, RS-232-C/RS-422-A interface without cable	750			
HDS7505	Asynchronous Terminal with 14-inch CRT, green or amber phosphor, RS-232-C or RS-422-A interface	995			
HDS7807	Synchronous/Asynchronous Terminal with 14-inch CRT, green or amber phosphor, RS-232-C or RS-422-A interface	1,200			
DATANET 8 SERIES NETWORK PROCESSORS AND OPTIONS					
DCU8110	DATANET 8/10 Network Processor system with 1MB of memory expandable to 2MB; supports a maximum of 31 data communications ports and includes 3 RS-232-C/V.24 asynchronous/character synchronous ports	23,900	130	1,195	795
DCU8120	DATANET 8/20 Network Processor system with cache memory, 1MB of memory expandable to 2MB. System is upgradable to dual-processor system with dual-cache memory; supports 31 data communications ports extendable to 127 ports and includes 3 RS-232-C/V.24 asynchronous/char. synchronous ports	38,000	215	1,900	1,275
DCU8130	DATANET 8/30 Network Processor system with cache memory and 2MB of memory expandable to 4MB. System is upgradable to dual-processor system with dual-cache memory; supports 159 data comm. ports expandable to 255 ports and includes 3 RS-232-C/V.24 asynchronous/char. synchronous ports	80,000	350	4,000	2,675
DATANET OPTIONS					
OPTIONS FOR THE DATANET 8/10 ONLY:					
DCM8110	1-megabyte Memory Expansion Module	7,000	50	350	230
OPTIONS FOR DATANET 8/20 ONLY:					
DCP8120	Extended Performance Option; includes second processor and associated cache memory	14,000	115	700	475
DCM8120	1-megabyte Memory Expansion Module	7,000	50	350	235
DCE8121	First Line Expansion Module; provides support for up to 32 additional data communications ports (max. 63 ports per DATANET 8/20)	2,500	5	125	85
DCE8122	Second Line Expansion Module; provides support for up to 64 additional data communications ports (max. 127 ports per DATANET 8/20); requires DCM8120 and DCE8121	5,000	10	250	170
OPTIONS FOR DATANET 8/30 ONLY:					
DCP8130	Extended Performance Option; includes second processor and associated cache memory	27,000	220	1,350	900
DCM8130	2-megabyte Memory Expansion Module	14,000	100	700	470
DCE8131	Line Expansion Module; provides support for up to 96 additional data communications ports (max. 255 ports per DATANET 8/30); requires DCM8130	7,500	15	375	250

NA—Not available.

NC—No charge.

Honeywell Bull DPS 90 Series

		Purchase Price (\$)	Monthly Maint. (\$)	1-Year Lease (\$)	4-Year Lease (\$)
DATANET OPTIONS (Continued)					
OPTIONS FOR DATANET 8/10, 8/20, AND 8/30:					
DCF8002	Visual Display Terminal Console, 24-by-80 character screen; one required for each DATANET 8/10, 8/20, or 8/30	795	20	40	30
DCF8003	Hard Copy Console Receive Only Printer (100 cps); one required for each system that uses DATANET 8, 8/10, 8/20, or 8/30 Network Processors	1,195	22	60	40
DCF8004	Console Table for Console Components	750	NA	40	25
DCF8005	Second 5¼-inch Diskette Drive	800	16	40	25
DCE8106	Network Processor Channel Connection to DPS 8 with Input/Output Multiplexer	8,000	65	339	288
DCE8109	Network Processor Channel Connection to DPS 88 System with Channel Adapter Unit	8,000	65	339	288
DCE8111	Network Processor Channel Connection to DPS 90 System with Input/Output Processor	8,000	65	339	288
DCF8052	Multiline Communications Controller-16 (MLC-16) accommodates up to four Communications Interface Adapters; maximum of 16 data communications ports per MLC-16	2,700	15	135	90
LOW- AND MEDIUM-SPEED OPTIONS:					
DCF8073	RS-232-C Asynchronous/Character Synchronous Integrated Communications Interface Adapter with four RS-232-C/V.24 data communications ports; includes four 50-ft. cables. Maximum port speed is 19.2K bps	2,000	16	100	70
DCF8049	RS-232-C Bit Synchronous HDLC Integrated Communications Interface Adapter with two RS-232-C/V.24 data communications ports; includes two 50-ft. cables. Maximum port speed is 19.2K bps.	3,200	26	160	110
DCF8053	Low- and Medium-Speed Asynchronous/Character Synchronous Communications Interface Adapter; accommodates up to four Line Interface Module Connections; any combination of DCF8055, DCF8057, and DCF8059 is allowed	1,000	7	50	35
DCF8055	RS-232-C/V.24 Asynchronous/Character Synchronous Line Interface Module with one RS-232-C/V.24 data communications port; includes one 50-ft. cable. Maximum port speed is 19.2K bps	275	3	15	10
DCF8059	MIL-188-C Asynchronous/Character Synchronous Line Interface Module with one MIL-188-C data communications port; includes one 50-ft. cable. Maximum port speed is 19.2K bps	275	3	15	10
MEDIUM- AND HIGH-SPEED OPTIONS:					
DCF8061	Medium- and High-Speed Character Synchronous or Bit Synchronous Communications Interface Adapter; accommodates one Line Interface Module Connection (DCF8062, DCF8063, DCF8064, DCF8065, DCF8067, DCF8069, or DCF8071)	2,200	16	110	75
MEDIUM-SPEED OPTIONS FOR DCF8061:					
DCF8062	RS-232-C/V.24 Bit Synchronous (HDLC) Line Interface Module with one RS-232-C/V.24 data communications port; includes one 50-ft. cable. Maximum port speed is 19.2K bps	275	3	15	10
HIGH-SPEED OPTIONS FOR DCF8061:					
DCF8064	X.21 Bit Synchronous (HDLC) Line Interface Module with one X.21 data communications port; includes one 50-ft. cable. Maximum port speed is 64K bps	450	3	25	15
DCF8067	MIL-188-C Bit Synchronous (HDLC)/Character Synchronous Line Interface Module with one MIL-188-C data communications port; includes one 50-ft. cable. Maximum port speed is 64K bps	450	3	25	15
DCF8069	V.35 Bit Synchronous (HDLC) Character Synchronous Line Interface Module with one V.35 data communications port; includes one 50-ft. cable. Maximum port speed is 64K bps	450	3	25	15
DCF8071	Bell 301/303 Bit Synchronous (HDLC)/Character Synchronous Line Interface Module with one Bell 301/303 data communications port; includes one 50-ft. cable. Maximum port speed is 64K bps	450	3	25	15
OTHER OPTIONS FOR DATANET 8, 8/10, 8/20, AND 8/30:					
DCF8024	Direct Connect Capability for one Asynchronous or Character Synchronous Line with RS-232-C Physical Interface	350	2	14	12
DCF8026	Universal Modem Bypass; character synchronous to 19.2K bps. RS-232-C physical interface	415	2	16	13

NA—Not available.
NC—No charge.

Honeywell Bull DPS 90 Series

		Purchase Price (\$)	Monthly Maint. (\$)	1-Year Lease (\$)	4-Year Lease (\$)
NETWORK PROCESSOR CHANNEL CONNECTIONS					
DCE8020	DATANET 8 Network Processor Channel Connection Feature; each connection feature provides one IOP channel, cables, and associated interface in the DATANET 8	8,000	72	346	295
DCE8119	DATANET 8/10, 8/20, 8/30 Network Processor Channel Connection Feature; provides one IOP channel, cables, and associated interface in the DATANET systems	8,000	72	346	295
Network Processor Channel Exchange Features:					
MXF8628	Channel Exchange Feature for DATANET 8 and PPS	3,500	NA	NA	NA
MXF8641	Channel Exchange Feature for DATANET 8/10, 8/20, and 8/30	3,500	NA	NA	NA
MXF8630	Channel Exchange Feature for DATANET 6641/6651/6661/6678; provides one IOP host connection feature to connect DATANET 66 processor previously connected to a Level 66 or DPS 8 system to the DPS 8000 system	3,500	NA	NA	NA
Hyperchannel Connections:					
MXF8640	DPS 8000 Series Hyperchannel Connection Feature A161	14,000	111	1,111	745
MXF8632	DPS 8000 System Channel Exchange Feature for connecting existing A161 Hyperchannel Subsystem previously attached to a Level 66 or DPS 8 to an IOP	5,300	NA	NA	NA
MXF8639	Power Sequence for FIPS channel/subsystem	3,200	5	200	149
NA—Not available. NC—No charge.					

SOFTWARE PRICES

		Monthly License Fee (\$)	Ex- panded Support Charge (\$)	Initial License Fee (\$)	License Orig. Fee (\$)	Annual Basic Support (\$)
GCOS 8 SYSTEM RELEASE 3000						
Operating System Executives:						
SVS8053	GCOS 8 Operating System Executive	2,800	NSC	—	8,000	—
SVS8055	GCOS 8 OP Exec for DPS 90	4,700	NSC	—	12,000	—
SVS8050	GCOS 8 Basic System	NSC	(1)	—	8,000	—
Operating System Extensions:						
SVE8000	FMS Catalog Cache Facility	81	16	—	—	—
SVE8001	FMS Test Access Facility	82	10	—	—	—
SVE8002	Password Encryption Facility	68	6	—	—	—
SVE8038	Console Manager	235	30	—	—	—
SVE8039	NP Operator Console	112	6	—	—	—
SVE8040	Console Journal	165	12	—	—	—
SVJ8000*	Parametric JCL	44	7	—	—	—
SVP8000*	System Maintenance Facility	107	53	—	—	—
SVP8001	Software Management Facility	93	15	—	—	—
SVP8002	System Performance Analysis	343	31	—	—	—
SVS8014	Six Processor Support	73	14	—	—	—
SVP8081	Composition System Maintenance Facility; DPS 8000	683	126	—	—	—
Operating System Utilities:						
SNU0471	PPS Utilities	31	5	—	—	—
SNU0472*	PPS Off-line	NSC	—	—	—	—
SNU0473*	PPS On-line	NSC	—	—	—	—
SVU8000*	System Utilities	63	7	—	—	—
SVU8001	File Generation Facility	59	5	—	—	—
SVU8002*	Sort/Merge Facility	131	21	—	—	—
SVU8012*	File Management System Utility	386	56	—	—	—
SVU8018	VIDEO	25	5	—	—	—
SVU8025	Comp System Utility Facility	185	30	—	—	—
SVU8026	UTL8	175	—	—	—	—

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Honeywell Bull DPS 90 Series

GCOS 8 SYSTEM RELEASE 3000 (Continued)

		Monthly License Fee (\$)	Ex- panded Support Charge (\$)	Initial License Fee (\$)	License Orig. Fee (\$)	Annual Basic Support (\$)
System Administration:						
SVE8043T	HAPS 8 Basic System	850	—	20,000	—	3,000
SVE8044T	HAPS 8 On-Line	250	—	5,500	—	—
SVU8041T	Tape Management System	675	—	22,000	—	2,600
SVP8012*	PARS	354	37	—	—	—
SVU8016	Mass Store I/O Analyzer	—	—	2,500	—	—
SVU8017	CAPSUL	329	37	—	—	—
SVU8022	FACTS	—	—	14,500	—	—
SVU8023	SARA	—	—	14,800	—	—
SVU8024	TRS	—	—	6,950	1,045	—
Time Sharing Facilities:						
SVE8008	TSS File Management Option	133	13	—	—	—
SVE8009	TSS Adv. Application Support Option	197	39	—	—	—
SVE8010	TSS Media Input Option	65	13	—	—	—
SVE8013	TEX	383	76	—	—	—
SVE8014	TSS Editing Option	119	26	—	—	—
SVE8015	TSS Document Format Option	60	13	—	—	—
SVE8016*	TSS Electronic Mail Option	200	39	—	—	—
SVE8017	TSS Sort Interface Option	83	13	—	—	—
SVE8018	TSS DM-IV Option	96	16	—	—	—
SVE8019	TSS Administration Option	139	19	—	—	—
SVE8020	Multicopy TSS Support Option	656	129	—	—	—
SVS8005	TSS Facility	98	26	—	—	—
Languages and Compilers:						
SEL6012	Lisp	—	—	3,825	—	—
SEL6013	Pascal	—	—	8,609	—	—
SEL6014*	Compiler B	—	—	5,739	—	—
SVD8004	TSS Databasic	179	28	—	—	—
SVE8011	TSS Cobol-74	65	13	—	—	—
SVE8012	TSS Fortran-66	60	13	—	—	—
SVE8022	TSS Fortran-77	65	13	—	—	—
SVL8000	Cobol-74 C and R Facility	328	33	—	—	—
SVL8001	Fortran-66 Compiler	417	59	—	—	—
SVL8002	PL/1 C and R Facility	336	59	—	—	—
SVL8003	RPG-II Facility	159	5	—	—	—
SVL8007	TSS Basic	238	45	—	—	—
SVL8008	Cobol-68 Compiler	381	49	—	—	—
SVL8010	Fortran-77 C and R Facility	251	18	—	—	—
SVL8011	Fortran-77 Hex Exp. Option	NSC	—	—	—	—
SVL8012	Fortran-66 Compatibility	NSC	—	—	—	—
SVL8013	Cobol-74 RQ	106	12	—	—	—
SVL8015	C Programming Language	340	—	8,000	—	800
SVL8016	Fortran-77 ESV C and R	534	40	—	—	—
SVR8000	Cobol-74 Runtime Facility	106	11	—	—	—
SVR8002	PL/1 Runtime Facility	92	13	—	—	—
SVR8004	Fortran-77 Runtime Facility	71	5	—	—	—
SVR8005	Fortran-77 ESV Runtime Facility	161	17	—	—	—
SVL8024	DPS 8000 Cobol-85 Compiler and Runtime Facility	358	54	716	—	—
SVL8030T	DPS 8000 Ada Compiler and Runtime Facility	—	1,815	40,000	—	—
Data Management Facilities:						
SVD8006*	DD/DS Basic Facility	343	43	—	—	—
SVD8007*	DD/DS On-line Option	153	19	—	—	—
SVD8000	DM-IV Standard Facility	1,225	215	—	—	—
SVD8001	DM-IV Fortran Subschema Trans.	141	12	—	—	—
SVD8002	I-D-S/I Facility	1,341	137	—	—	—
SVD8003	Index Sequential Processing Facility	36	8	—	—	—
SVD8011	Multicopy DM-IV/TP Concurrency	366	37	—	—	—
SVD8067	Interrel for DPS 8000	1,500	210	9,800	—	—
SVU8004	Comprehensive Archival System	665	1,920	16,000	—	—

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Honeywell Bull DPS 90 Series

Monthly License Fee (\$)	Ex-panded Support Charge (\$)	Initial License Fee (\$)	License Orig. Fee (\$)	Annual Basic Support (\$)
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GCOS 8 SYSTEM RELEASE 3000 (Continued)

End-User Facilities:

SVE8025	Mail 8 Server	105	15	—	—	—
SNM7804	Personal Computer Interconnect	—	495	—	—	75
SVH8047	Infoedge for DPS 8000	700	100	—	—	—
SVH8053	Infoedge-Reporter for DPS 8000	275	40	—	—	—
SVH8058	Infoedge-Example Query for DPS 8000	425	50	—	—	—
SNU8000	TGRAF-05	395	—	—	—	3,500
SVU8035	Dr TEK 4010	—	—	750	—	113
SVU8036	Dr TEK 4105	—	—	750	—	113
SVU8037	Dr TEK 4107/4109	—	—	1,250	—	188
SVU8038	Dr TEK 4115/4125	—	—	1,750	—	263
SVU8039	Dr Matrix QCC	—	—	1,250	—	118
SVU8040	Dr HP 7475/Sweet-P	—	—	750	—	113
AFF0001*	Management Support Center; annual license fee, \$72,500	—	—	150,000	—	15,000
SNM7800	PC7800 Emulator	295	—	—	—	—
SNM7803	PC7800 for Macintosh	295	—	—	—	—
SVD8005	I-D-S/I DQ	215	41	—	—	—
SVE8023	Forum 8	180	33	—	—	—
SVE8046	EDIT 8	415	—	10,000	—	1,500
SVH8000*	PCF	207	35	—	—	—
SVH8001*	EQ	420	48	—	—	—
SVH8002*	IQ	324	36	—	—	—
SVH8003*	Credo	252	31	—	—	—
SVH8004	Texto	—	—	35,000	—	3,500
SVH8005	Texto Logotel	—	—	13,200	—	1,320
SVP8003	DM-IV QRP	458	72	—	—	—
SVP8004	DM-IV PLP	321	56	—	—	—
SVP8006	MDQS/II	734	141	—	—	—
SVP8007	MDQS/IV	1,269	254	—	—	—
SVP8020	Syntax-Directed Editor	225	25	—	—	—
SVU8020*	Grafmaster	—	1,650	11,000	—	—
SVU8027*	Solution Center Menu	200	24	—	—	—
SVU8028	DI-Textpro	4,250	—	—	—	638

Programmer Productivity Facilities:

SVH8006	Magna 8	—	—	120,000	—	14,400
SVP8008	Debug Support System	124	24	—	—	—
SVP8009	Cobol-74 Debug Support	219	32	—	—	—
SVP8010	Fortran-77 Debug Support	268	12	—	—	—
SVP8014	Softool Cobol	1,400	—	33,500	—	8,375
SVP8015	Softool CCC	1,500	—	30,000	—	7,500
SVP8016	Complete Softool	2,500	—	60,000	—	15,000
SVP8018	System-80 Cobol	780	—	18,400	—	1,840
SVP8021	Auditec	—	—	18,000	—	2,700
SVP8022	System-80 DM-IV Optional	500	—	12,000	—	1,800
SVP8023	System-80 Cobol with DM-IV Optional	1,280	—	30,400	—	3,640
SVU8029	Business-Graf	—	—	27,750	—	4,163
SVU8021*	Scientific/Engineer	—	1,575	10,500	—	—
SVU8050	UW Tools	500	—	10,500	—	1,050

Transaction Processing:

SVD8015	CTP	321	32	—	—	—
SVE8033	DM-IV/TP ELQ	275	55	—	—	—
SVP8013	TATS	500	—	10,800	—	1,620
SVP8017	TSM	980	—	24,000	—	1,920
SVS8002	DM-IV/TP Facility	1,714	207	—	—	—
SVS8006	TDS	2,025	266	—	—	—
SVS8007	TPE	710	70	—	—	—
SVS8017	TP8	2,140	243	—	—	—
SVU8003	DM-IV/TP Forms Facility	339	64	—	—	—

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Honeywell Bull DPS 90 Series



GCOS 8 SYSTEM RELEASE 3000 (Continued)

		Monthly License Fee (\$)	Ex-panded Support Charge (\$)	Initial License Fee (\$)	License Orig. Fee (\$)	Annual Basic Support (\$)
Special Packages:						
SVD8024	DDE Basic System	1,828	290	—	—	—
SVD8028	DDE Comp package for TDS	4,208	596	—	—	—
SVD8031	DDE Comp package for TPE	3,955	551	—	—	—
SVD8033	DDE Management Facility for TDS	1,746	287	—	—	—
SVD8034	DDE Management Facility for TPE	1,632	269	—	—	—
SVS8003	DM-IV/TP Comp Facility	3,395	476	—	—	—
SVS8009	DM-IV/TP System Management Facility	1,260	259	—	—	—
Other Software:						
SVS8012	GCOS 8 SR2000 P	45	—	—	—	—
SVS8013	GCOS 8 SR2000 SER DB	38	—	—	—	—
SVS8015	GCOS 8 SR2300 P	57	—	—	—	—
SVS8016	GCOS 8 SR2300 SER DB	45	—	—	—	—
SVS8019	GCOS 8 SR2500 P	62	—	—	—	—
SVS8020	GCOS 8 SR2500 SER DB	52	—	—	—	—
SVS8057	GCOS 8 SR3000 P	70	—	—	—	—
SVS8058	GCOS 8 KP and C	60	—	—	—	—
GCOS 8 Communications Facilities:						
SVC8000*	GRTS-II Facility	345	58	—	—	—
SVC8001*	GRTS-II HDLC Support	166	14	—	—	—
SVC8002*	NPS Facility	1,232	265	—	—	—
SVC8003*	NPS HDLC Support	166	14	—	—	—
SVC8004	Extended NP Support	176	36	—	—	—
SVC8006	FTF66	21	7	—	—	—
SVC8040*	Inter Bisync-GRTS-II	97	18	—	—	—
SVC8048*	GRTS	569	139	—	—	—
SVC8049	HYPERchannel Support	135	25	—	—	—
SVC8050*	Inter Bisync-NPS	97	18	—	—	—
SVC8051	UFT8	200	72	—	—	—
SVC8052	DSANET	125	20	—	—	—

Monthly License Fee (\$)	Optional Monthly Support Charge (\$)
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DATANET 8 Distributed Network Supervisor Software

SNC8120	Distributed Network Supervisor 300	560	99
SNC8121	Network Operator Interface	11	5
SNC8123	Host Connect Support for DPS 8, 88, and 90	60	11
SNC8131	HDLC Data Link Control point to point	95	18
SNC8122	Value-Added Network Support, X.25, PAD, PBX, and LAN	185	33
SNC8126	Primary Network Support, X.21	185	33
SNC8127	Interactive Binary Synchronous Terminal Support (3270)	90	17
SNC8128	Remote Batch Binary Synchronous (2780/3780) Workstation Support	80	14
SNC8129	Remote Computer Interface (RCI) Terminal Support	50	9
SNC8130	Logical High-Level Data Link Control	125	22
SNC8190	Host Administrative Facilities	155	28
SNC8193	Network Administration Facility	35	6
SVC8051	Unified File Transfer 8	200	72
SNC8195	Distributed Network Supervisor/Entry GCOS 8	450	80
SNC8197	Remote Switch/Concentrator	375	66
SNC8118	Eight-Inch Diskette Software Updates for DN8	10	NC
SCC3209	Remote Batch Facility/6 (RBF/6)	32	6
SCC3210	Distributed Job Processing	67	14

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