

# Honeywell DPS 90 Series

## MANAGEMENT SUMMARY

**UPDATE:** To satisfy the needs of its largest mainframe accounts, Honeywell Information Systems has been volume shipping its top-end DPS 90 system, a processor line based on NEC Corporation mainframe technology. So far, about 50 such systems have been installed in the U.S. While no major DPS 90 enhancements have been announced since initial introduction in March 1985, Honeywell has enhanced its medium- to large-system product lines as a whole this year with the introduction of a new family of DATANET 8 communications processors, a new magnetic tape line, and the availability of IBM Model 3380E disk storage devices. The Model 3380E product has a storage capacity of 5.04 gigabytes per unit.

Although it was not formally announced, Honeywell began making IBM's 3380E higher capacity storage devices available to customers by the end of last year. Initially, Honeywell provided customers with the IBM 3380 storage devices (marketed as the MSU3380/3382), which it purchases on a OEM basis. These devices have a storage capacity of 1.8 gigabytes per unit. Now both the 1.8-gigabyte and 5.04-gigabyte versions are available to Honeywell customers.

The new family of DATANET 8 front-end communications processors replaces the previously offered DATANET 8 processor. The new line consists of the DATANET 8/10, 8/20, and 8/30, three DATANET 8 versions which vary in capability and features. The availability of three models rather than just one allows users to select the appropriate machine level on a price/performance basis. The 8/10 supports up to 31 data communications lines, the 8/20 supports from 31 to 127 lines, and the 8/30 supports from 159 to 255 lines.

The new MTS8200 Magnetic Tape Subsystem, purchased on an OEM basis from Storage Technology, consists of a ▶

The (Distributed Processing System) DPS 90, now the most powerful processor series in the Honeywell 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:** 1 to 4 CPUs, 32 to 256 megabytes of main memory, 1 to 4 input/output processors, and 16 to 64 channels.

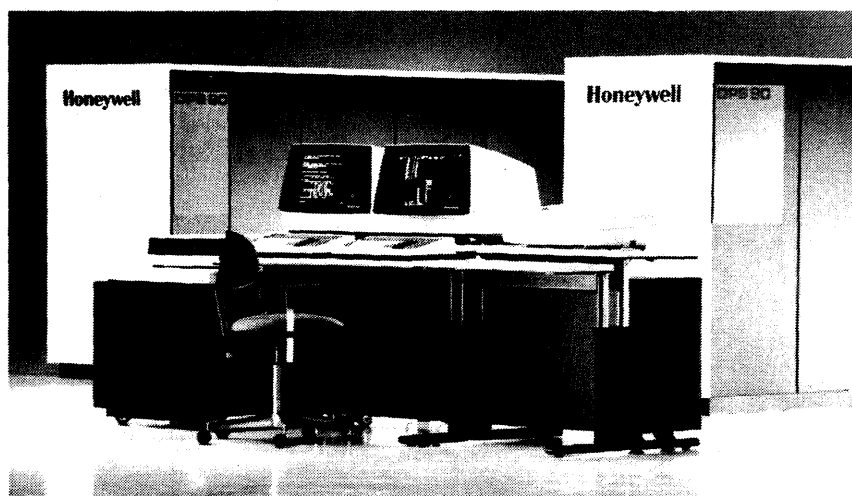
**COMPETITION:** Amdahl 5890 Series, Burroughs A-15, Control Data Cyber 180, IBM 3090 Series, NAS AS/XL Series,

**PRICING:** Prices range from \$3,950,000 to \$8,350,000.

## CHARACTERISTICS

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

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



*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.*

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▷ single-channel controller and tape drive. Seven additional drives can be added to the controller/tape unit. The tape subsystem supports 800, 1600, and 6250 bpi tapes. A subsystem can be expanded to support two controllers and 16 tape drives. The tape and disk systems also meet Federal Information Processing Standards (FIPS).

With the introduction of the top-end DPS 90 line last year, Honeywell Information Systems managed to remain a serious contender within the high-end mainframe world, an accomplishment that's no easy feat for the handful of U.S. mainframe manufacturers continuing to compete in a slump-ridden computer industry. Honeywell continues to compete particularly at the high end through multinational partnerships. The DPS 90 processor line is based on a collaboration with NEC Corporation of Japan, a mainframe manufacturer with whom Honeywell has enjoyed a long association over the years. Honeywell and NEC entered into a cross-licensing agreement in 1984 to develop a processor series based largely on NEC S-1000 technology. Honeywell, together with NEC and Groupe Bull of France, its European partner, are all marketing the systems worldwide.

In addition to the DPS 90 Series, Honeywell will continue its commitment to the large-scale mainframe world with the planned introduction of a DPS 90 follow-on line sometime in 1989. The new processors will be based on NEC S-2000 processors and are expected to be 3 to 3.5 times more powerful than the current DPS 90 line, according to a Honeywell marketing official. In a related development, Honeywell announced in July that it reached an agreement in principle with NEC to market NEC SX1 and SX2 supercomputers in North America as part of a joint venture. No further details were disclosed.

Honeywell announced the DPS 90 in March 1985, just one month after the announcement of IBM's new top-of-the-line processor family, the 3090. From a technology standpoint, the DPS 90 is competitive with the 3090 and the several other 3090-class systems introduced in 1985. The new Honeywell 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 new series features the new 256K-bit memory chips, current mode logic chips, integrated vector-processing capabilities, and high-capacity main memories. DPS 90 memory capacity ranges from 32 to 256 megabytes.

The new series is designed to handle high-volume workloads in commercial, interactive, and engineering/scientific environments. Besides addressing the large-computer capacity needs of *Fortune 500* and big government customers, the built-in vector capabilities of the DPS 90 Series allow these same customers access to a number cruncher without having to purchase a much more expensive supercomputer. Honeywell shipped the first models during the spring of 1985. Volume shipments began by the first quarter of 1986. The DPS 90 Series offers more memory capacity and delivers up to three times the processor performance ▷

### ▶ DATA FORMATS

**BASIC UNIT:** 9-bit bytes organized functionally to process 36-bit word groupings of information. Special features are also included for ease in manipulating 4-bit groups, 6-bit groups, 9-bit groups, 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-, 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:** 9-bit ASCII code is standard.

### MAIN STORAGE

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

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TABLE 1. SYSTEM COMPARISON

MODEL	DPS 90/91	DPS 90/92	DPS 90/92T	DPS 90/93	DPS 90/94
<b>SYSTEM CHARACTERISTICS</b>					
Date announced	March 1985	March 1985	March 1985	March 1985	March 1985
Date first delivered	June 1985	April 1985	April 1985	—	—
Field upgradable to	DPS 90/92	DPS 90/92T	DPS 90/93	DPS 90/94	—
Relative performance	—	—	—	—	—
Number of processors	1	2	2	3	4
Cycle time, nanoseconds	—	—	—	—	—
Word size, bits	36	36	36	36	36
Operating systems	GCOS 8	GCOS 8	GCOS 8	GCOS 8	GCOS 8
<b>MAIN MEMORY</b>					
Type	256K-bit MOS	256K-bit MOS	256K-bit MOS	256K-bit MOS	256K-bit MOS
Minimum capacity, bytes	32MB	32MB	64MB	64MB	64MB
Maximum capacity, bytes	128MB	128MB	256MB	256MB	256MB
Increment size	32MB	32MB	32MB	32MB	32MB
Cycle time, nanoseconds	—	—	—	—	—
<b>BUFFER STORAGE</b>					
Minimum capacity	128KB	128KB	128KB	128KB	128KB
Maximum capacity	128KB	128KB	128KB	128KB	128KB
Increment size	—	—	—	—	—
<b>INPUT/OUTPUT CONTROL</b>					
Number of channels:					
Byte multiplexer	—	—	—	—	—
Block multiplexer	—	—	—	—	—
Word	—	—	—	—	—
Other	16-32	16-32	32-64	48-64	64

▷ of Honeywell's previously most powerful computer series, the DPS 88. DPS 90 models are designed to serve at the center of communications networks that could typically involve other Honeywell systems ranging from the DPS 6 to the DPS 88 Series.

Like the other newly announced processor lines in its class, the DPS 90 Series is designed to meet the needs of organizations with workloads growing at a rate of 20 to 50 percent annually. The DPS 90 Series is positioned to provide a growth path for Honeywell large-system users who have outgrown the capabilities of Honeywell's DPS 8 and DPS 88 product line. The DPS 90/91 single-processor mainframe is said to deliver 30 to 70 percent greater performance than 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.

To make it possible to run the GCOS operating system and GCOS-based applications Honeywell had to modify the NEC S-1000-based processor that the DPS 90 is based on to make it compatible with the GCOS 8 operating system, with other Honeywell peripherals, and with its communications system. Honeywell systems operating under GCOS 8 can readily migrate to the DPS 90.

The new processor line operates under an enhanced version of GCOS 8, and is software compatible with the DPS 8 and DPS 88 Series. This makes it possible for DPS 8 or DPS 88 users to upgrade to the more powerful processors without major difficulties. DPS 8 users, in fact, can upgrade directly to the DPS 90 Series should their capacity requirements exceed the capabilities of the DPS 88. All the DPS 90 processors, except for the top-end DPS 90/94, are also field upgradable to progressively more powerful processors within the series.

▶ part of the MMU fail, the affected part is released by the IOP 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 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)
- System Control Center (SCC)
- Interface Adapter Unit (IAU)

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➤ Additionally, 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 this year on the DPS 90 at the request of users who needed to migrate from DPS 8 configurations to more powerful systems.

### COMPETITIVE POSITION

In quick step with the rest of the mainframe world, Honeywell has placed a renewed emphasis on engineering and scientific processing with the introduction of the DPS 90 series. The series features built-in vector capabilities for mixed application environments running both commercial and scientific workloads. Plans to market NEC supercomputers will no doubt strengthen Honeywell's credibility in this area.

Besides engineering/scientific capabilities, Honeywell continues to stress on-line transaction processing capabilities, a well established Honeywell marketing area.

Honeywell has strongly addressed the on-line systems market throughout its large system line with emphasis on fault-tolerant capabilities, high availability, and high throughput. The DPS 90 is no exception in these respects. Most of the processors come with some degree of built-in redundancy to minimize downtime, while the DPS 90/92T comes as a fully-redundant system featuring two of each major system component. Honeywell believes interactive processing and fault-tolerant capabilities give its large system products 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 to IBM in commercial batch processing capabilities.

The built-in vector processing capabilities for engineering and scientific work places the DPS 90 in competition with Control Data's Cyber 180 Series and Digital Equipment's VAX systems, computer lines with well established followings in the engineering/scientific market. Other vendors now finding this market exploitable include IBM and IBM plug-compatible vendors, and a handful of start-ups that have developed so-called "minisupercomputers," scaled down supercomputers that are modeled after Cray supercomputers, but at a fraction of the cost.

Honeywell users running vectorized Fortran programs can invoke 63 vector instructions. The vector capability has been benchmarked at 6.7 MFLOPS (millions of floating points per second), operating in half precision word mode, and 5 MFLOPS operating in full-precision word mode, according to Honeywell. IBM's new 3090 Vector Facility consists of a hardware attachment that adds 171 vector instructions and 16 vector registers. While IBM's Vector Facility must be purchased separately, Honeywell's vector capabilities are included with the processor.

Honeywell's existing large-scale user base can make good use of the DPS 90's two major strong points, on-line systems and vector processing. About half of the DPS 90 accounts so far have been General Electric customers who ➤

➤ 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 Central Processing Unit (CPU) executes instructions from both application and system programs. The unit contains five elements: 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.

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 *Main Memory Unit* (MMU) uses metal oxide semiconductor (MOS) 256K-bit chips. A single MMU can be configured to contain 32 to 128 megabytes of main memory. ➤

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► need the engineering/scientific "horsepower," according to a Honeywell spokesperson. Various GE sites have been upgrading from smaller or less powerful systems such as the DPS 88 Series. Some GE accounts have already told Honeywell they could use the power of an NEC S-2000 immediately. Honeywell plans to introduce a follow-on series by the end of this decade that will be based on the S-2000.

Interestingly, 70 percent of the DPS 90 systems sold so far have been the DPS 90/92T, the fully redundant processor system. Many of these sites are trading up from dual processor systems and feel more secure with tandem systems. In all, about 50 DPS 90 systems have been installed in the U.S.

The DPS 90 contains most of the current state-of-the-art features to keep Honeywell in the same advanced technology league with IBM and the other vendors responding to the IBM 3090 announcements. All the new processor products are featuring high-capacity main memories and the new 256K-bit memory chips, except for IBM, which is using higher density 288K-bit chips. Most of the new high-end processor lines offer main memories of up to 256 megabytes, except for Amdahl and NAS, which now offer top-end models with memory configurations up to 512 megabytes. IBM offers a maximum memory configuration of 128 megabytes on the 3090 Model 400. With the IBM Expanded Storage option, users can also configure a system with up to 640 megabytes of Expanded Storage.

### ADVANTAGES AND RESTRICTIONS

With the help of NEC, Honeywell introduced the DPS 90 Series in 1985 to satisfy the processing needs of its biggest accounts outgrowing the capabilities of older Honeywell systems such as the DPS 88 and DPS 8. Although the DPS 90 is based on NEC mainframe technology, the machine is architecturally similar to the DPS 88, a home-grown Honeywell product. For instance, both processor lines use a pipeline-processing architecture, a technique that makes it possible to simultaneously process six CPU instructions in various stages of execution for enhanced throughput. Both systems also make use of current mode logic, a computer logic said to be similar to the emitter-coupled logic now used on such competing systems as the IBM 3090. These new logic chips achieve faster switching speeds and consume less power.

Major differences between the DPS 88 and DPS 90 center around memory capacity, throughput enhancement techniques, and scientific processing capabilities. The differences between the DPS 88, first announced four years ago, and the new DPS 90 reflect the advances within mainframe technology over the past few years. The DPS 90 uses the new 256K-bit MOS chips and can be configured with 256 megabytes of memory rather than the 128-megabyte maximum memory on the DPS 88 Series. DPS 90 main memory units also make use of eight-way interlacing that helps speed up memory accesses and increase throughput. The DPS 88 processors use four-way interlacing.

► Larger systems configured with two MMUs can contain up to 256 megabytes of main memory.

The *System Control Unit* (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 *System Control Center* (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 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 *Interface Adapter Unit* (IAU) contains two backpanels which each support four general-purpose adapters. The adapters permit attachment of peripheral equipment complying with Federal Information Processing Standards. With additional backpanels, the IAU may be configured with up to 14 general-purpose adapters.

The *Power Sequencer* (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 System Control Center.

The *I/O Processor* (IOP) handles data transfers between peripheral equipment and the MMU. Each IOP has four high-speed channel processors (HCPs) that each, 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 for System Control Centers, are connected through the HCPs. System Control Centers connect to a separate multiplexer.

The IOP, itself a computer, has a one-megabyte local memory containing peripheral control and maintenance system software. The IOP, connected to the system control unit, 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 and the Maintenance System Operating Supervisor. IOP Software (IOPSW) processes connects and interrupts, dispatch to other IOP software modules, logical-to-physical channel mapping, and report status. Maintenance System Operating Supervisor, (MSOS), the other software 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

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TABLE 2. MASS STORAGE

MODEL	MSU0451	MUS0500	MSU0501	MSU3380	MSU3382	MSU3380E
Cabinets per subsystem	16	8-15	8-15	8	8	1-16
Disk packs/HDA's per cabinet	1	2	2	2	2	2 HDAs
Capacity	156MB	626MB	1.1GB	1.8GB	1.8GB	1260MB or 2520MB per HDA
Tracks/segments per drive unit	815	1630 per surface	1686 per surface	13,275	13,275	—
Average seek time, msec.	30	25	25	16	16	15 to 17
Average access time, msec.	38.3	33.3	33.3	24.3	24.3	23.3 to 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	—
Comments	Removable	Fixed	Fixed	Fixed HDAs	Fixed HDAs	—

➤ Another major DPS 90 feature 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.

Besides scientific work, Honeywell continues to offer a product that appeals to the transaction processing market. The firm offers a fully-redundant DPS 90/92T and builds redundancy features into its other processors to insure system availability.

Like most competing vendors trying to protect their customer base, Honeywell has made it possible for existing Honeywell customers to migrate from the DPS 8 and DPS 88 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.

At the storage level, Honeywell provides customers with two IBM-based disk products. The MSU3380 disk unit/controller and the MSU3382 slave disk unit each hold 1.8 gigabytes of information and achieve a transfer rate of three megabytes per second. Additionally, Honeywell customers can obtain IBM's extended capacity 3380 units which hold 5.04 gigabytes of information. The availability of the extended capacity devices now makes Honeywell competitive with other mainframe vendors.

### USER REACTION

Datapro contacted a DPS 90/91 single processor user who recently installed the Honeywell system primarily for computer-aided engineering applications. The firm designs diesel engines. The company migrated from a four-processor DPS 8/70 system operating under the CP-6 operating system to a DPS 90 that has also been retrofitted to run the CP-6 operating system. "We worked with Honeywell to get the CP-6 system on the DPS 90," the user explained. (Control Program) CP-6 is a Honeywell enhancement of a former Xerox developed operating system that has been available on Honeywell DPS 8C processors for some time.

➤ 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 is setable during a CLIMB instruction. In this mode, new four-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 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 four 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 VAC, +12 VAC, -28 VAC 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 six degrees from 120 V nominal.

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

### 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 Central Processing Unit (CPU), one Input/Output Processor (IOP) ➤

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TABLE 3. INPUT/OUTPUT UNITS

Magnetic Tape Units	Number of Tracks	Recording Density, Bits/Inch	Encoding	Tape Speed, Inches/Sec.	Transfer Rate, Bytes/Sec.
MTU0500	7	556/800	NRZI	125	52K/75K
MTU0500	9	556/800/ 1600	NRZI/ NRZI/ PE	125	70K/100K/200K
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	1200 lpm	136	10	6 or 8	4-to-19 width x 3-to-11 length
PRU1600	1325 lpm	136 or 160	10	6 or 8	4-to-22 width x 3-to-22 length

▶ The user said his firm wanted to migrate to the DPS 90 to improve single job turnaround time. The addition of more processors on the old DPS 8/70 system made it possible to run more jobs, but could not improve single job turnaround, he explained. With the installation of the DPS 90/91, single jobs run an average of 8 to 10 times faster than on the 8/70. Jobs have run as high as 12 times faster and no slower than 5 times faster, he said.

To date, this Honeywell user said he has been especially impressed with DPS 90 diagnostic capabilities. The site is situated in a area subject to power failures which can be damaging to sensitive computer hardware. The user said the DPS 90 system's diagnostic software has been able to accurately pinpoint a failing circuit board card. Detecting card failures in older Honeywell systems involved trial-and-error techniques to narrow down and pinpoint the most likely source of hardware failure, he said.

While the user has seen no major failings or drawbacks with the DPS 90 so far, he said he is anticipating the addition of an improved Honeywell Fortran vector compiler which is currently in the works. □

▶ with four high-speed channel processors, one Main Memory Unit with 32 megabytes of main memory, one System Control Unit (SCU), one Power Supply Unit (PSU), one System Control Center with serial printer, and one Interface Adapter Unit (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 transfer of information between the device and the Input/Output Processor. 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

## Honeywell DPS 90 Series

► the MSU3380/3882 mass storage units are purchased on an OEM basis from IBM.

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 Input/Output Processor 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 the 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 else 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 bpi capability and the first MTU 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 could 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, a card reader/punch unit that reads at 400 cards per minute and punches at 100 cards per minute, 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 price list.

### 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 Distributive Network Supervisor 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 *Distributed Network Supervisor (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 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 crossbarred 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 switch and remote concentrators in a DSA communications network.

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, Distributed Network Supervisor.

DATANET 8/10 is a single processor system which provides support for a maximum of 31 data communications lines. The basic system includes one megabyte of central memory expandable to a maximum of two 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 hardcopy printer may be required.

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

DATANET 8/20 is a single processor system with cache memory and one 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 two megabytes by adding a one megabyte memory option. A basic system also includes a 5¼-inch diskette drive for executive software support. A second 5¼-inch diskette drive is optionally available. A console visual display terminal is required with each 8/20, and a hardcopy console printer may be required. Three RS-232-C asynchronous data communications ports are included with each DATANET 8/20. The basic system provides support for up to 31 data communications ports, expandable to 127 ports with power and line expansion module options. Expansion of individual data communications ports is accomplished by ordering various communications interface adaptors and line interface module options. These options accommodate line characteristics such as data transmission speed, asyn- ►



## Honeywell DPS 90 Series

TABLE 4. TERMINALS

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

► chronous/synchronous operation, and physical interfaces such as RS-232-C.

DATANET 8/30 is a single-processor system with cache memory and two 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 four megabytes by adding a two-megabyte memory option. A 5/4-inch diskette drive is included for executive software support, while a second 5/4-inch diskette drive is optionally available. A console visual display terminal is required with each 8/30 and a console hardcopy printer may be required. Three RS-232-C asynchronous data communications ports are included with each 8/30. The basic system provides support for 159 data communications ports expandable to 255 ports with a line expansion module option. Data communications interface adaptors and line interface module options make it possible to expand individual data communications ports. These options specify line characteristics such as maximum speed, asynchronous/synchronous operation and physical interfaces such as RS-232-C.

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

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

- 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 to 19.2K bps.
- MIL-188-C Asynchronous/Character Synchronous Line Interface Module (DCF8059). This module has one MIL-188-C data communications port, includes one 50-foot cable (DCE to DTE) for device attachment, and has a maximum transmission speed to 19.2K bps.
- Medium/High Speed Character Synchronous/Bit Synchronous Communications Interface Adaptor (DCF8061). This option is a nonintegrated adaptor capable of supporting one medium speed (to 19.2K bps) or one high speed (to 64K bps) data communications line via one of the following Line Interface Modules.

The following Line Interface Modules are allowed with DCF8061:

- RS-232-C/V.24 Bit Synchronous HDLC Line Interface Module (DCF8062). This module has one RS-232-C/V.24 data communications port, includes one 50-foot cable (DCE to DTE) for device attachment, and has a maximum data transmission rate to 19.2K bps.
- X.21 Bit Synchronous HDLC Line Interface Module (DCF8064). This module has one X.21 data communications port, includes one 50-foot cable (DCE to DTE) for device attachment, and has a maximum data transmission rate to 64K bps.

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

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- ▶ • V.35 Bit Synchronous HDLC/Character Synchronous Line Interface Module (DCF8069). This module has one V.35 data communications port, includes one 50-foot cable (DCE to DTE) for device attachment, and has a maximum data transmission rate to 64K bps.
- Bell 301/303 Bit Synchronous/Character Synchronous Line Interface Module (DCF8071). This module has one Bell 301/303 data communications port, includes one 50-foot cable (DCE to DTE) for device attachment, and has a maximum data transmission rate to 64K bps.

### SOFTWARE

**OPERATING SYSTEM:** The Honeywell GCOS 8 (General Comprehensive Operating Supervisor 8) is the primary operating system available on the DPS 90 processor line. GCOS 8 is a multidimensional operating system common to all large-scale Honeywell systems from the DPS 8 and DPS 88 family of processors to the DPS 90. Under the latest release of GCOS 8, Release 2500, substantial changes were implemented that permits the DPS 90 Series to accommodate the Input/Output Processor (IOP) and other DPS 90 hardware characteristics. The operating system will dynamically adjust to the hardware configuration it serves. A single copy of the operating system is developed and maintained.

The DPS 90 can also operate under the (Control Program) CP-6 operating system. CP-6, a system that has long been available on DPS 8C processors, includes facilities for interactive time-sharing, on-line transaction processing, and multiprogrammed local and remote batch processing. The availability of the CP-6 system on the DPS 90 permits DPS 8 users operating under CP-6 to migrate to the larger DPS 90 systems. (For a detailed description of CP-6 functions and features, please refer to the DPS 8 report on page 70C-458MM-501 in this volume.)

The vast majority of Honeywell users continue to run GCOS, making it Honeywell's dominant operating system. Many of the significant GCOS operating system differences implemented with the DPS 90 involve reliability, availability, and serviceability tools, and facilities that were incorporated into GCOS 8 software, the IOP's resident MSOS software, and in firmware. A major software feature unique to the DPS 90 is the integrated vector processing and the large program and data structures the system supports. These features are readily visible to the end user.

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

According to Honeywell, current GCOS users can upgrade to GCOS 8, and user programs (with few exceptions) that have been running under GCOS will run unchanged under GCOS 8.

GCOS 8 is user-defined and user-oriented with multidimensional capabilities. It is a batch system, a time-sharing system, and a transaction processing system. GCOS 8 balances the use of system resources, and gives multiple options for customizing the system for each user's needs. GCOS 8 concurrently supports 1) batch processing, 2) remote job entry (RJE), 3) interactive remote job entry (IRJE), 4) time-

sharing, 5) transaction processing, 6) direct program access, 7) on-line test and diagnostics, 8) on-line program test and development, and 9) electronic mail.

GCOS 8 is a flexible operating system that features hardware transparency, meaning that the user has no need to know the particular architecture of the system, its hardware, I/O devices, or processor types. All processors can access all of memory and can execute any program. GCOS 8 can address real memory up to memory-capacity limits. Up to 477 user programs of up to one megabyte each can be executed concurrently. GCOS 8 can use up to 128 megabytes of memory for time-sharing. It provides high throughput by efficient and rapid scheduling of all activities, which reduces operator intervention.

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

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

Real physical memory is limited to a maximum of 256 megabytes or 64,000 pages. Virtual memory can consume up to 8 gigabytes or 2 million 4K-byte pages divided into 512 work spaces. Out of the 512 spaces, up to 477 are available for user programs.

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.

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

Hardware and software system security is provided in several ways. The operating system will abort an activity if an illegal operation is received. The File Management Supervisor provides a common file system for all processor operating dimensions as well as protective and restorative functions to ensure file integrity. Access to files is controlled through several levels. Files are grouped in a hierarchical order by user name, access restrictions, and resource control. File names are qualified by comparing them to the user names under which they are cataloged. Passwords may be required as an additional form of user identification. Access to files is under the originator's discretion and control. Each user can have a multilevel hierarchical subcatalog structure, with the ability to assign access controls and passwords at each subcatalog level. Another safeguard is a hardware implementation that controls access to sets of memory segments called domains. This structure protects programs and files from intentional access by unauthorized personnel and unintentional access during debugging procedures. ▶

## Honeywell DPS 90 Series

► **PROGRAMMING LANGUAGES:** Language processors available for use on the DPS 90 systems under GCOS 8 are Cobol-74, Cobol-68, Fortran-66, Fortran-77, PL/1, Basic, data Basic, Pascal, Compiler "B," Lisp, APL, RPG II, and "C."

**DATE BASE MANAGEMENT:** The GCOS 8 *DM-IV Data Manager* component of *Data Management-IV* handles the data base management functions. Data Manager, also referred to as *Integrated Data Store/II (I-D-S/II)*, administers the creation of the physical and logical structures of the data base and controls the creation of the application-specific views of that data base which are used in processing. It further serves as the interface between the data base and the various DM-IV processors that access the data base and perform operations upon it.

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

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

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

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

The DM-IV Transaction Processor (TP) provides the facility for rapid, efficient, on-line data base processing. It is most effectively used in applications where the end user has little or no knowledge of the operating system or storage structure, or data processing in general. Its internal design is optimized for high-volume transaction processing where extremely fast response and fast, automatic restart/recovery are required. The TP system includes both on-line software components for processing the actual transaction and a variety of support software products for program testing, library updating, and TP system generation. Within DM-IV/TP, there are five major functional components: Transaction Manager, Data Base Manager, Integrity Manager, Message Manager, and Executive Manager.

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

ates each transaction control task which TP processes and controls the communication between application routines.

- The Database Manager controls all data base activities for on-line files assigned to TP. The executive software also provides for dynamic allocation and deallocation of data base files to TP for uninterrupted continuous operation.
- The Integrity Manager provides for fast, automatic recovery and restart after any type of application or system failure. This includes everything from rollback of the data base after an application program abort to the complete reconstruction of a destroyed data base.
- The Message Manager is the executive software component that actually handles the communication interface with the terminal network supported by the Front-End Network Processor (FNP). The Message Manager provides both the physical and logical interface to the on-line network of terminals and handles the acceptance and delivery of input and output messages.

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

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

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

The optional DM-IV Procedural Language Processor (PLP) is an extension of QRP which provides a high-level, procedure-oriented language for use by application and system programmers. When using the Query and Reporting Processor end-user facilities, the user need not be concerned with the database structure or access methods.

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

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

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

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

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

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

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

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

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

**DATA COMMUNICATIONS:** Distributed Network Supervisor (DNS) has been designed specifically for use in Datanet 8 Front-End Processors, and is part of a set of communication software products based on Honeywell'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 network processors in conjunction with a DPS 90 host running the GCOS 8 operating system to provide support for transaction process-

ing, distributed transaction processing, distributed terminal concentration, time-sharing, remote job entry, direct program access, and networks made up of DPS 90s, DPS 88s, DPS 8s, DPS 7s, and DPS 6s in any combination. DNS supports private networks, Public Data Networks (PDNs), and Value Added Networks (VANs), including X.25 packet switched and X.21 circuit switched networks.

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

DNS supports a variety of terminals such as the Honeywell TWU/PRU 1003, 1005, and 1901, VIP 7700/7700R/7800 Series and VTS7710. Also supported is the DPS 6-DSA software package that allows a DPS 6 or Level 6 system to function as a distributed processor and to communicate with a DPS 90 host in a DSA network.

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

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

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

Transaction Driven System (TDS) is designed for high-volume, on-line transaction processing. TDS differs substantially in internal architecture from the GCOS Transaction Processing System (TPS), but it complements TPS by giving a total DPS 90 transaction processing capability. The TDS internal design is optimized for high-volume transaction processing where extremely fast response and fast, automatic restart/recovery are required.

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

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

► sharing. A single copy of TSS can support up to 600 users, assuming enough memory, I/O, and communications facilities are provided. In multiple-processor systems, the time-sharing users' programs can simultaneously use as many processors as desired by the site. A separately priced Multi-copy Support Option allows from two to four copies of the time-sharing executive to run on one DPS 90 system, thereby increasing the number of users that can be supported.

DPS 90 GCOS time-sharing users have a choice of six major programming languages: Cobol-74, Extended Basic, Pascal, Time-Sharing Fortran-66, Fortran-77, and APL. Time-sharing users can communicate directly with batch-mode facilities, permitting the development and testing of programs, data entry, control of batch program execution, and manipulation of results from remote terminals.

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

**PROGRAM DEVELOPMENT:** Honeywell offers a number of programmer productivity tools and aids. Several of these programs are described in the following paragraphs. *Syntax Directed Editor (SDE)* is a productivity tool designed to support the creation or modification of Cobol-74 programs. SDE reduces the amount of code that a programmer must enter and immediately checks for format and syntax errors.

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

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

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

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

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

**OTHER SOFTWARE:** Products under this category include simulation packages, a text editing facility, and finally, a listing of applications packages for specific business segments or industries.

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

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

*Honeywell Error Logging and Analysis (ELAN)* system is a software system concentrated mostly within the Input/Output Processor and its resident MSOS software. The DPS 90 is capable of storing cabinet status the instant an error is detected. A fault dictionary is then used to locate the failure if it is solid or recurring. MSOS communicates with GCOS 8 through MSOS Extension Execution Program (MEEP), a GCOS 8 module.

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

Honeywell offers the following application programs for the DPS 90 systems.

#### Banking Applications

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

#### Manufacturing Applications

- Honeywell Manufacturing System (HMS)
- Inventory Record Management Module
- Manufacturing Data Control Module
- Material Requirements Planning Module
- Master Production Scheduling Module
- Statistical Forecasting Module
- Capacity Requirements Planning Module
- Automatically Programmed Tools (APT)
- American Software Sales Forecasting
- American Software Inventory Management
- American Software Custom Order Processing
- American Software Purchasing and Material Management Distribution Applications
- PROFIT (Inventory Control)
- Point-of-Sale System

#### Management Science Application Programs

- Mathematical Programming System (MPS)
- BMDP Statistical Programs
- SPSS Statistical Package
- IMSL Math/Statistics Library
- Project Management and Control System (PMCS) ►

## Honeywell DPS 90 Series

- ▶ • GPSS Simulation System
- Numerically Integrated Elements for Systems Analysis—(NISA) (Structural Analysis)
- Polo Finite (Structural Analysis)
- Coordinate Geometry (COGO)
- Concordance Generator Program

### Honeywell Integrated MSA Systems

- MSA Accounts Payable Systems
- EMSA Accounts Receivable System
- MSA Budgetary Control System
- MSA Fixed Assets System
- MSA Foreign Exchange System
- MSA General Ledger System
- MSA Human Resourced Management System

### Miscellaneous Application Programs

- Individualized Mathematics Instruction/66 (IMS/66)
- ROLIN (Rapid On-Line Information Network)
- Employment Security Application Packages

### Education Support

- Large Systems Marketing Education Support
- Galler Educators Information System—Financial/Administrative System for K-12
- SCT Human Resources, Higher Education
- SCT Financial System, Higher Education
- SCT Student Information, Higher Education

### PRICING & SUPPORT

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

The GCOS 8 operating system for the DPS 90 comprises two components: A Basic System which is required for initialization and configuration of the system software and hardware, and an Operating Executive which provides the environment and services needed by other GCOS 8 products and services. There is an initial license fee for the GCOS 8 Basic System and a monthly license fee for the Operating Executive. 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 also separately priced.

**SUPPORT:** The basic monthly rentals entitle the user to unlimited central processor usage per month with on-call remedial maintenance between the hours of 8 a.m. and 6 p.m. on Mondays through Fridays, except for local Honeywell holidays. For maintenance beyond this period, the user pays an additional charge which is a fixed percentage of the base maintenance charge. For scheduled extended maintenance service (24 hours, 7 days per week), the additional charge is 40 percent of the base maintenance charge. Hourly rates for unscheduled maintenance outside of the daily 8 a.m. to 6 p.m. period are listed in the above chart.

Honeywell's TotalCare Program provides support services for hardware and software. These services include Basic and Extended Hardware Maintenance Site Preparation, Installation, On-site Dedicated Maintenance, Basic and Expanded Software Support, On-site Software Support, and Soft-

ware Installation. Remote testing and diagnostic facilities include the National Response Center for toll-free, 24-hour-a-day contact with Honeywell; the Technical Assistance Center which provides remote support; the Logistics Inventory Data System for rapid location of parts; and the ELAN software system for troubleshooting.

Honeywell offers five categories of support products for DPS 90 systems. These products include technical engineering, software, education, publications, and supplies.

System engineering falls into one of five billable support categories, as described in the following table.

	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.

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

**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	\$3,950,000
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
Twelve MSU3382 Slave Units; (1.8GB per unit)	773,400
Two MTS8218 Magnetic Tape Subsystem	109,300
Two MTF8201 Cross Bar Switches; (2 by 8)	12,260

## Honeywell DPS 90 Series

▶ Twelve MTU8208 Tape Units; (200 ips)	265,200
URP8901 Unit Record Processor	20,000
Two PRU0908 (900 lpm)	69,950
Two PRU1208 (1200 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
One MGF8901 Motor Generator Sequencing	4,000
PSS8900 Power Sequencing	4,000
<b>TOTAL PURCHASE PRICE:</b>	<b>\$6,038,995</b>

## MEDIUM CONFIGURATION

DPS 90/92 Dual Complex includes two Central Processing Unit, 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)	\$5,000,000
CMM8932 Memory Module; additional 32MB	400,000
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
Twelve MSU3382 Slave Units; (1.8GB per unit)	773,400
Two MTS8218 Magnetic Tape Subsystem	109,300
Two MTF8201 Cross Bar Switches; (2 by 8)	12,260
Twelve MTU8208 Tape Units; (200 ips)	265,200
URP8901 Unit Record Processor	20,000
Four PRU1208 (1200 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
One MGF8901 Motor Generator Sequencing	4,000
PSS8900 Power Sequencing	4,000
<b>TOTAL PURCHASE PRICE:</b>	<b>\$7,542,390</b>

## 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	\$8,350,000
Two CMM8932 Memory Modules; additional 64MB	800,000
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
Twelve MSU3382 Slave Units; (1.8GB per unit)	773,400
Two MTS8218 Magnetic Tape Subsystem	109,300
Two MTF8201 Cross Bar Switches; (2 by 8)	12,260
Twelve MTU8208 Tape Units; (200 ips)	265,200
URP8901 Unit Record Processor	20,000
Four PRU1208 (1200 lpm)	153,100
Two DCE8111 DPS 90 Network Processor Connections	16,000
One DCU 8120 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
One MGF8901 Motor Generator Sequencing	4,000
PSS8900 Power Sequencing	4,000
<b>TOTAL PURCHASE PRICE:</b>	<b>\$11,292,390</b>

## Honeywell DPS 90 Series

### EQUIPMENT PRICES

		Purchase Price (\$)	Monthly Maint. (\$)	1-Year Lease (\$)	4-Year Lease (\$)
<b>PROCESSORS</b>					
CPS8990	DPS 90/91 Central System includes a single CPU and 32 megabytes of main memory	3,950,000	6,250	246,875	183,721
CPS8992	DPS 90/92 Central System includes two CPUs and 32 megabytes of main memory	5,000,000	7,500	312,500	232,558
CPS8996	DPS 90/92T fully redundant version contains two of each central system component and 64 megabytes of main memory	6,250,000	9,250	390,625	290,698
CPS8993	DPS 90/93 Central System includes three CPUs and 64 megabytes of main memory	7,300,000	10,500	456,250	339,535
CPS8994	DPS 90/94 Central System includes four CPUs and 64 megabytes of main memory	8,350,000	11,750	521,875	388,372
<b>ADDITIONAL MEMORY</b>					
CMM8932	Additional 32-megabyte memory module	400,000	800	25,000	18,605
<b>SYSTEM UPGRADES</b>					
CPK8991	DPS 90/91 to DPS 90/92	1,200,000	950	75,000	55,814
CPK8992	DPS 90/92 to DPS 90/93	2,000,000	2,700	125,000	93,023
CPK8993	DPS 90/93 to DPS 90/94	1,000,000	950	62,500	46,512
CPK8996	DPS 90/92 to DPS 90/92T	950,000	1,450	59,375	44,186
CPK8997	DPS 90/92T to DPS 90/93	1,000,000	950	62,500	46,512
CPK8981	DPS 90/91 to DPS 90/92 with second IOP	1,550,000	1,250	96,875	72,093
CPK8982	DPS 90/92 to DPS 90/93 with second and third IOP	2,350,000	3,000	146,875	109,302
CPK8983	DPS 90/93 to DPS 90/94 with fourth IOP	1,300,000	1,250	81,250	60,465
CPK8984	DPS 90/92 to DPS 90/92T with second IOP	1,300,000	1,750	81,250	60,465
CPK8985	DPS 90/92T to DPS 90/93 with third IOP	1,300,000	1,250	81,250	60,465
<b>CHANNEL OPTIONS</b>					
MXU8902	Additional Input/Output Processor with four high-speed channel processors	500,000	300	31,250	23,256
MXF8903	Exchange Feature, high-speed channel	5,000	—	156	116
MXF8904	Exchange Feature; network processor channel	6,500	—	94	70
MXF8905	Exchange Feature; low-speed channel	5,000	—	156	116
MXF8906	Exchange Feature; data streaming channel	12,500	—	156	116
MXF8909	Exchange Feature; Federal Information Processing Standard tape channel	12,500	—	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
<b>INTERFACE ADAPTER UNIT AND OPTIONS</b>					
MXU8910	Basic IAU; supports up to 8 GPA channels	52,650	150	3,291	2,449
MXF8921	Channel expansion for MXU8910; provides support for 9 to 16 channels	2,800	10	175	130
MXF8923	Power Expansion for MXU8910	5,200	5	325	242
MXF8927	Power Sequencer for MXU8910; 1 to 8 GPA channels	3,200	5	200	149
MSF8928	Power Sequencer Expansion for MXU8910; 9 to 16 GPA channels	2,600	5	162	121
MXF8023	General Purpose Adapter for tape	18,500	15	850	700
MXF8023	General Purpose Adapter for disk	18,500	15	850	700
<b>POWER OPTIONS</b>					
MGS8801	Motor Generator	38,000	70	1,280	1,025
MGF8901	Motor Generator Sequencing	4,000	—	250	—
PSS8900	Power Sequencing	4,000	—	250	—
<b>MASS STORAGE SUBSYSTEM</b>					
<b>Processors and Features:</b>					
MSP3881	Mass Storage Processor includes two storage directors and two attachment channels	75,270	202	4,460	3,795
MSP3885	Mass Storage Processor includes two storage directors and four attachment channels	90,270	226	5,350	4,550
MXF8916	Data Streaming Channel attachment feature	8,000	12	500	372
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

NA—Not available.  
NC—No charge.



## Honeywell DPS 90 Series

		Purchase Price (\$)	Monthly Maint. (\$)	1-Year Lease (\$)	4-Year Lease (\$)
<b>Processors and Features (Continued)</b>					
MSP8022	Integrated Secondary Single-Channel Mass Storage Processor	29,000	82	1,720	1,460
MSP8023	Integrated Secondary Single-Channel Mass Storage Processor	32,000	90	1,900	1,615
MSF8021	Dual Channel Option for MSP8021 and MSP8023	16,300	54	965	820
MSF8022	Dual Channel Option for MSP8022	16,300	54	965	820
MSA8011	Addressing capability for four MSU0451s or for two MSU0500/0501s	NC	NC	NC	NC
MSF8018	Primary Host Channel Connection to DPS 90 high speed channel	3,500	6	175	145
MSF8019	Switched Host Channel Connection for DPS 90 high speed channel	4,600	7	230	195
MSF3881	MSP3881 upgrade to MSP3885	16,000	26	890	755
MSK0501	Upgrade Kit; MSU0500 to MSU0501	10,800	25	361	297
MSK0502	MSU0500 Upgrade Kit for additional head disk assembly	3,468	—	—	—
MSF0011	MSU0501 Dual Access Feature	4,140	23	163	136
MSF0501	MSU0501 Additional Head Disk Assembly	15,808	—	—	—
<b>Disk Drives:</b>					
MSU3380	Head-of-String Mass Storage Disk Drive includes a built-in controller and two HDAs	88,800	325	4,780	4,070
MSU3382	Slave Mass Storage Disk Drive includes two HDAs and attaches to the MSU3380	64,450	240	3,470	2,960
MSU0451	Removable Disk Mass Storage Unit, 156 megabytes	27,047	122	1,140	950
MSF0006	Dual Access Feature for MSU0451	2,070	14	89	76
MSF0007	Remote Position Sensing Option for MSU0451	2,025	14	87	76
MSU0500	Dual Fixed Disk Mass Storage Unit; 626 megabytes, formatted	38,850	172	1,386	1,154
MSU0501	Dual Fixed Disk Mass Storage Unit; 1101 megabytes, formatted	49,650	197	1,747	1,452
MSK0501	Upgrade kit; MSU0500 to MSU0501	10,800	25	361	297
<b>MAGNETIC TAPE SUBSYSTEM</b>					
MTP8021	Freestanding Primary Magnetic Tape Processor, which includes 1600/6250 bpi capability and first MTU addressing feature; requires a minimum of one channel connection feature	29,000	180	1,620	1,355
MTP8022	Integrated Secondary Magnetic Tape Processor	29,000	180	1,620	1,355
MTP8023	Integrated Primary Magnetic Tape Processor	22,000	137	1,230	1,030
MTU0500	Magnetic Tape Unit	12,128	175	725	613
MTU0610	Magnetic Tape Unit; includes cartridge load	21,000	175	801	677
MTU0630	Magnetic Tape Unit	14,815	130	593	505
<b>MTS8200 Subsystems:</b>					
MTS8205	Magnetic Tape Subsystem includes tape processor, one MTU8205 tape unit; FIPS compliant	55,350	526	2,913	2,516
MTS8206	Magnetic Tape Subsystem includes tape processor, one MTU8206 tape unit; FIPS compliant	52,700	549	2,774	2,395
MTS8208	Magnetic Tape Subsystem includes tape processor, one MTU8208 tape unit; FIPS compliant	54,650	613	2,876	2,484
MTS8215	Magnetic Tape Subsystem; FIPS compliant	55,350	526	2,913	2,516
MTS8216	Magnetic Tape Subsystem; FIPS compliant	52,700	549	2,774	2,395
MTS8218	Magnetic Tape Subsystem; FIPS compliant	54,650	613	2,876	2,484
MTF8200	1 x 8 Switch	NC	NC	NC	NC
MTF8201	2 x 8 Switch	6,130	14	323	279
MTF8204	Switched Channel 90	8,000	12	421	364
MTK8211	Altitude Adapter	NC	NC	NC	NC
MTU8205	Magnetic Tape Unit; 556/800 bpi	19,725	338	1,038	897
MTU8206	Magnetic Tape Unit; 800/1600 bpi	20,150	363	1,061	916
MTU8208	Magnetic Tape Unit; 1600/6250 bpi	22,100	427	1,163	1,005
<b>Features for the MTU0500:</b>					
MTF0018	Cartridge Load Capability	735	3	28	24
MTF0540	75 ips, 9-Track	1,029	121	138	132
MTF0541	75 ips, 7-Track	1,029	121	138	132
MTF0542	125 ips, 9-Track; includes cartridge load	4,872	77	218	189
MTF0543	125 ips, 7-Track; includes cartridge load	5,523	123	324	279
<b>Features for the MTU0610:</b>					
MTF0607	800/1600 bpi feature	6,090	75	300	260
MTF0608	1600/6250 bpi feature	13,319	115	511	432
MTK0678	Upgrade Kit; MTF0607 to MTF0608 performance	10,784	48	211	172
<b>Features for the MTU0630:</b>					
MTF0634	75 ips, 800/1600 bpi	4,725	140	286	257
MTF0635	75 ips, 1600/6250 bpi	7,110	120	342	300
MTF0636	125 ips, 800/1600 bpi	9,805	158	460	398

NA—Not available.

NC—No charge.

## Honeywell DPS 90 Series

Features for the MTU0630 (Continued)		Purchase Price (\$)	Monthly Maint. (\$)	1-Year Lease (\$)	4-Year Lease (\$)
MTF0637	125 ips, 1600/6250 bpi	10,330	150	460	398
MTK0630	Performance upgrade MTF0634 to MTF0635	2,385	20	75	60
MTK0631	Performance upgrade MTF0636 to MTF0637	1,700	25	55	45
MTK0632	Performance upgrade MTF0634 to MTF0636	5,080	20	175	145
MTK0633	Performance upgrade MTF0635 to MTF0637	3,220	20	120	100
MTK0634	High Altitude Adapter	240	—	8	6
<b>PRINTERS</b>					
PRU908	High-Speed Belt Printer; 900 lpm	34,975	421	2,065	1,720
PRU1208	High-Speed Belt Printer; 1200 lpm	38,275	468	2,340	1,920
PRU1600	High-Speed Belt Printer; 1325 lpm	64,940	538	2,910	2,472
<b>PRU1600 Options:</b>					
PRB0500	OCR-B Print Belt	2,460	90	179	164
PRB0524	OCR A/B Print Belt	2,460	90	179	164
PRB0532	Puerto Rico Print Belt	2,460	94	179	164
PRB0549	OCR-A Alphanumeric Print Belt	2,460	90	179	164
PRB0600	ASCII Belt; upper-/lowercase	2,567	90	184	166
PRF0022	24 Additional Print Positions; 136 to 160	2,610	16	112	93
<b>PUNCH CARD EQUIPMENT</b>					
URP8901	DPS 90 Unit Record Processor	20,000	30	1,250	930
MXF8915	Low Speed Channel Attachment Feature for URP8901	8,000	12	500	372
URA0050	URP0600 Addressing Capability for PCU0121 and CCU0401	4,253	4	151	123
URA0056	URP0600 Addressing Capability for CRU0501	265	—	9	6
CRU0501	Card Reader; 500 cpm	19,500	119	684	568
CCU0401	Card Reader/Punch; 400 cpm (read); 100 to 400 cpm (punch)	29,594	219	1,228	1,032
PCU0121	Card Punch; 100 to 400 cpm	20,032	153	900	698
CCK0401	Upgrade Kit; PCU0121 to CCU0401	9,562	79	328	334
<b>TERMINALS</b>					
VIP7201	Asynchronous, Multipurpose Keyboard Display Terminal	795	20	—	—
VIP7301	Standard Keyboard Display Terminal with RS-422-A interface and 25-foot cable; includes optional RS-232-C interface	1,900	20	—	—
VIP7303	Word Processing Keyboard Display Terminal with RS-422-A interface and 25-foot cable; includes optional RS-232-C interface	1,900	20	—	—
VIP7307	Data Entry Keyboard Display Terminal with RS-422-A interface and 25-foot cable; includes optional RS-232-C interface	1,900	20	—	—
VIP7305	Multifunction Keyboard Display Terminal with RS-232-C/RS-422-A interface and 25-foot cable	1,900	20	—	—
VIP7814	Synchronous/Asynchronous Keyboard Display Terminal with 12-inch diagonal CRT, 1,920-character display positions	2,700	25	—	123
VIP7815	Synchronous/Asynchronous Keyboard Display Terminal with 15-inch CRT green phosphor, RS-232-C, and RS-422-A interfaces	3,095	30	—	138
VIP7823	Asynchronous Keyboard Display Terminal with Multifunction Keyboard; includes a 72-line scroll feature, buffered print adapter, and 25-foot RS-422-A cable	2,350	25	—	—
<b>DATANET 8 SERIES NETWORK PROCESSORS AND OPTIONS</b>					
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
<b>DATANET OPTIONS</b>					
OPTIONS FOR THE DATANET 8/10 ONLY:					
DCM8110	One-megabyte Memory Expansion Module	7,000	50	350	230
DCE8105	Multiple Network Processor Channel Connection Adapter for DATANET 8/10 and medium systems only; required for DATANET 8/10 to support multiple Network Processor Channel Connections (NPCC) to DPS 7 or DPS 7/E Systems (max. 2). A second NPCC connection, DCE8103 or DCE8104 must be ordered with this adapter.	25	NA	2	1

NA—Not available.  
NC—No charge.

## Honeywell DPS 90 Series

## DATANET OPTIONS (Continued)

		Purchase Price (\$)	Monthly Maint. (\$)	1-Year Lease (\$)	4-Year Lease (\$)
OPTIONS FOR DATANET 8/20 ONLY:					
DCP8120	Extended Performance Option; includes second processor and associated cache memory	14,000	115	700	475
DCM8120	One-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	Two-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
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
DCE8103	Network Processor Channel Connection to DPS 7/E Systems	8,000	65	339	288
DCE8104	Network Processor Channel Connection to DPS 7/E System	8,000	65	339	288
DCE8107	Network Processor Channel Connection to Level 66 DPS System	8,000	65	339	288
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
DCE8052	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 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 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 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, DCF8064, 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

NA—Not available.

NC—No charge.

## Honeywell DPS 90 Series

		Purchase Price (\$)	Monthly Maint. (\$)	1-Year Lease (\$)	4-Year Lease (\$)
<b>DATANET OPTIONS (Continued)</b>					
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.					

## SOFTWARE PRICES

		Monthly License Fee (\$)	Expanded Support Charge (\$)	Initial License Fee (\$)	Annual Basic Support (\$)
<b>GCOS 8 SYSTEM</b>					
Operating System Extensions:					
SVE8040	Console Journal	154	11	—	—
SVJ8000	Parametric JCL	40	6	—	—
SVP8000	System Maintenance	96	48	—	—
SVP8001	Software Management	87	14	—	—
SVP8002	System Performance Analysis	309	28	—	—
SVS8014	Six Processor Spt	68	13	—	—
SVP8082	Composition System Maintenance Facility; DPS 88 and DPS 90	800	180	—	—
Operating Systems Utilities:					
SNU0471	PPS Utilities	29	5	—	—
SNU0472	PPS Off-line	NSC	—	—	—
SNU0473	PSS On-line	NSC	—	—	—
SVU8000	System Utilities	57	6	—	—
SVU8001	File Generation Facility	55	5	—	—
SVU8002	Sort/Merge Facility	118	19	—	—
SVU8012	File Management System Utility	348	50	—	—
SVU8018	VIDEO	25	5	—	—
SVU8025	Comp System Utility Facility	185	30	—	—
SVU8026	UTL8	175	25	—	—
System Administration:					
SVD8006	DD/DS Basic Facility	309	39	—	—
SVD8007	DD/DS On-line	138	17	—	—
SVP8012	PARS	319	33	—	—
SVU8016	Mass Store I/O Analyzer	—	—	2,500	100
SVU8017	CAPSUL	296	33	—	—
SVU8022	FACTS	—	—	14,500	2,175
SVU8023	SARA	—	—	14,800	2,720
SVU8024	TRS	—	—	6,950	1,045
Time Sharing Facilities:					
SVE8008	TSS File Management	124	12	—	—
SVE8009	TSS Adv. Application Support	184	36	—	—
SVE8010	TSS Media Input	61	12	—	—
SVE8013	TEX	358	71	—	—
SVE8014	TSS Editing	111	24	—	—
SVE8015	TSS Document Format	56	12	—	—
SVE8016	TSS Electronic Mail	187	36	—	—
SVE8017	TSS Sort Intrfc	78	12	—	—
SVE8018	TSS DM-IV	90	15	—	—
SVE8019	TSS Administration	130	18	—	—
NA—Not available. NSC—No separate charge. NC—No charge.					

## Honeywell DPS 90 Series

GCOS 8 SYSTEM (Continued)		Monthly License Fee (\$)	Expanded Support Charge (\$)	Initial License Fee (\$)	Annual Basic Support (\$)
SVE8020	Multicopy TSS Support	613	121	—	—
SVS8005	TSS Facility	92	24	—	—
Languages and Compilers:					
SEL6012	LISP	—	—	3,825	—
SEL6013	PASCAL	—	—	5,739	—
SEL6014	Compiler B	—	—	8,609	—
SVD8004	TSS Databasic	156	24	—	—
SVE8011	TSS Cobal-74	61	12	—	—
SVE8012	TSS Fortran-66	56	12	—	—
SVE8022	TSS Fortran-77	61	12	—	—
SVL8000	Cobol-74 C & R Facility	290	29	—	—
SVL8001	Fortran-66 Compiler	390	55	—	—
SVL8002	PL/1 C & R Facility	314	55	—	—
SVL8003	RPG-II Facility	149	5	—	—
SVL8007	TSS Basic	222	40	—	—
SVL8008	Cobol-68 Compiler	337	43	—	—
SVL8010	Fortran-77 C & R Facility	235	17	—	—
SVL8011	Fortran-77 Hex Exp.	NSC	—	—	—
SVL8012	Fortran-66 Compatibility	NSC	—	—	—
SVL8013	Cobol-74 RQ	99	11	—	—
SVL8015	C Programming Language	340	—	8,000	800
SVL8016	Fortran-77 ESV C & R	465	35	—	—
SVR8000	Cobol-74 Rntm Facility	95	10	—	—
SVR8002	PL/1 Rntm Facility	86	12	—	—
SVR8004	Fortran-77 Rntm Facility	71	5	—	—
SVR8005	Fortran-77 ESV Rntm	140	15	—	—
Data Management Facilities:					
SVD8000	DM-IV Standard Facility	1,145	201	—	—
SVD8001	DM-IV Fortran Sub Tr.	132	11	—	—
SVD8002	I-D-S/I Facility	1,166	119	—	—
SVD8003	Index Sequential Processing Facility	31	7	—	—
SVD8011	Multicopy DM-IV/TP Conc.	330	33	—	—
End-User Facilities:					
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	187	36	—	—
SVE8023	Forum 8	180	33	—	—
SVE8041	EDIT 8	275	—	7,000	840
SVH8000	PCF	190	32	—	—
SVH8001	EQ	385	44	—	—
SVH8002	IQ	297	33	—	—
SVH8003	Credo	231	28	—	—
SVH8004	Texto	—	—	35,000	3,500
SVH8005	Texto Logotel	—	—	13,200	1,320
SVP8003	DM-IV QRP	413	65	—	—
SVP8004	DM-IV PLP	289	50	—	—
SVP8006	MDQS/II	673	129	—	—
SVP8007	MDQS/IV	1,164	233	—	—
SVP8020	Syntax-Directed Edit	225	25	—	—
SVU8020	Grafmaster	—	1,650	11,000	—
SVU8027	Solution Center Menu	200	24	—	—
Programmer Productivity Facilities:					
SVH8006	Magna 8	—	—	120,000	14,400
SVP8008	Debug Support System	116	22	—	—
SVP8009	Cobol-74 Debug Support	205	30	—	—
SVP8010	Fortran-77 Debug Support	250	11	—	—
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
SVU8019	Business-Graf	—	2,700	19,000	—
SVU8021	Scientific/Engineer	—	1,575	10,500	—
SVU8050	UW Tools	500	—	10,500	1,050

NA—Not available.

NSC—No separate charge.

NC—No charge.

## Honeywell DPS 90 Series

### GCOS 8 SYSTEM (Continued)

		Monthly License Fee (\$)	Expanded Support Charge (\$)	Initial License Fee (\$)	Annual Basic Support (\$)
Transaction Processing:					
SVD8015	CTP	300	30	—	—
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	1,530	185	—	—
SVS8006	TDS	1,761	231	—	—
SVS8007	TPE-II	617	61	—	—
SVS8017	TP8	2,000	227	—	—
SVU8003	DM-IV/TP Forms Facility	311	59	—	—
Special Packages:					
SVD8024	DDE Basic System	1,708	271	—	—
SVD8028	DDE Comp for TDS	3,933	557	—	—
SVD8031	DDE Comp for TPE	3,696	521	—	—
SVD8033	DDE Management Facility for TDS	1,632	268	—	—
SVD8034	DDE Management Facility for TPE	1,525	251	—	—
SVS8003	DM-IV/TP Comp Facility	3,031	425	—	—
SVS8009	DM-IV/TP System Management Facility	1,096	225	—	—
Other Software:					
SVS8012	GCOS 8 SR2000 P	39	—	—	—
SVS8013	GCOS 8 SR2000 SER DB	33	—	—	—
SVS8015	GCOS 8 SR2300 P	50	—	—	—
SVS8016	GCOS 8 SR2300 SER DB	40	—	—	—
SVS8019	GCOS 8 SR2500 P	60	—	—	—
SVS8020	GCOS 8 SR2500 SER DB	50	—	—	—

## SOFTWARE PRICES

		Monthly License Fee (\$)	Optional Monthly Support Charge (\$)
<b>DATANET 8 Distributed Network Supervisor Software</b>			
SNC8120	Distributed Network Supervisor	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 3/GCOS 8	450	80
SNC8197	Remote Switch/Concentrator	375	66
SNC8118	Eight-Inch Diskette Software Updates for DNS	10	NC
SCC3209	Remote Batch Facility/6 (RBF/6)	32	6
SCC3210	Distributed Job Processing	67	14

NA—Not available.

NSC—No separate charge.

NC—No charge. ■