

Honeywell Bull DPS 9000 Series

PRODUCT DESCRIPTION

With the introduction of the DPS 9000 Series, Honeywell Bull (HB) remains competitive at the extreme high end of the large-systems market. The new Honeywell Bull top-end series was jointly developed by Honeywell Inc., Groupe Bull of France, and NEC Inc. of Japan, the three firms that compose the Honeywell Bull consortium. The four-model series, formerly code-named Titan, is based mostly on NEC S-2000 mainframe technology, but is compatible with the Honeywell Bull GCOS 8 operating system. In addition to GCOS 8, Honeywell Bull developed the TP-8 transaction processing and networking software. The DPS 9000 Series, a follow-on to the DPS 90 Series, provides existing large-systems customers with an extended growth path.

When they announced the new series in November 1988, Honeywell Bull executives called the machines the most powerful general-purpose mainframes in the world, even eclipsing the new IBM 3090 S models and the Amdahl 5990 Series, which are now the acknowledged performance leaders. Honeywell Bull based such claims on the machines' transaction processing capabilities. DPS 9000 processors can perform more than 1,000 transactions per second using the TPI debit/credit benchmark. The systems are designed to address traditional Honeywell Bull markets and application areas: high-volume transaction processing, relational data base management, and complex networking. To further strengthen its commitment to these markets, the company also plans to make ORACLE available for all its mainframe products including the DPS 90. ORACLE, a relational data base management system from Oracle Corporation, has become an industry-standard relational data base.

In addition to data base and transaction processing, the DPS 9000 Series includes an integrated vector processor for numeric-intensive applications. The company believes

PRODUCT ANNOUNCED: DPS 9000 Series Models 91, 92T, 93, and 94.

COMPETITION: Amdahl 5990 Series, Control Data 990 Series, IBM ES/3090S Series, NAS AS/EX Series, and Unisys 2200/600 Series.

DATE ANNOUNCED: November 1988.

SCHEDULED DELIVERY: Second-quarter 1989.

BASIC SPECIFICATIONS

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

MODELS: DPS 9000/91 single processor, DPS 9000/92T tandem system, DPS 9000/93 triple processor, and DPS 9000/94 four-processor system.

CONFIGURATION: The DPS 9000 Model 91 consists of one Central Processing Unit (CPU), one System Control Unit (SCU), one Main Memory Unit (MMU) with 128 megabytes of memory, one Input/Output Processor (IOP) without channels, one Interface Adapter Unit (IAU) without channels, one System Control Center (SCC) cabinet, one SCC console, one System Support Processor (SSP), one DPS 9000 Unit Record Processor (URP), and one channel pair. The model requires a PRU0908 or PRU1208 printer.

The DPS 9000 Model 92T consists of two CPUs, two SCUs, two MMUs with a total of 256 megabytes of memory, two IOPs without channels, two IAUs without channels, one SCC cabinet, two SCC consoles, one SSP, two



Honeywell Bull's newest mainframe line, the DPS 9000 Series, is targeted for high-volume, information-intensive usage such as transaction processing and data management. The processor line is rated at more than 1,000 transactions per second using the TPI debit/credit benchmark.

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▷ this capability is important to customers implementing image and graphics processing, modeling, and simulations.

The DPS 9000 line consists of the Model 91, a single processor; the Model 92T, a fully redundant, two-processor system; the Model 93, a triple processor; and the Model 94, a quad processor. Main memory ranges from 128 megabytes to 1 gigabyte. They also use up to 1 megabyte of system-level cache in addition to 512 kilobytes of local CPU cache. Additionally, each Input/Output Processor (IOP) supports up to 64 physical channels and up to 256 logical channels. Users can install up to four IOPs in a maximum configuration. Each processor is field upgradable to the next larger processor. The first models will be available in May.

RELATIONSHIP TO CURRENT PRODUCT LINE: As would be expected, the new DPS 9000 Series features more memory capacity and faster throughput than Honeywell Bull's previous top-end model line, the DPS 90 Series. Memory capacity now reaches 1 gigabyte compared to 256 megabytes for the DPS 90s. The new models use a system-level cache that speeds up memory accesses to the Main Memory Unit (MMU), a feature the DPS 90s do not have. Additionally, the new models use one-megabit memory chips to pack more memory capacity into a smaller space. The DPS 90s use 256-kilobit chips. The DPS 9000 also features up to 64 physical channels per IOP or up to 256 physical channels for large configurations using four IOPs. The DPS 90 can be configured with up to 64 channels.

Environmentally, the DPS 9000 is partly liquid-cooled and partly air-cooled to dissipate heat. By contrast, the DPS 90 machines, also based on NEC mainframe technology, are air-cooled. The DPS 88 systems, designed and manufactured by the former Honeywell Information Systems, are water-cooled. While high-density packaging makes the DPS 9000 more compact than previous models, achieving ever higher densities usually leads to an inevitable move to liquid cooling. The DPS 9000 uses liquid cooling in the CPUs and the System Control Unit (SCU).

DPS 88 and 90 users can upgrade to the DPS 9000 without having to convert applications, since all three product lines run under the same GCOS 8 operating system. Users migrating to the DPS 9000, however, will face a processor swap-out, since direct field upgrades are not possible.

At the moment, Honeywell Bull has no plans to port the CP-6 operating system to the DPS 9000. CP-6 currently runs on DPS 8 and DPS 90 systems and represents a small part of the Honeywell Bull base.

In the hardware area, users can connect most existing Honeywell Bull peripherals to the DPS 9000. Some of the newest Honeywell Bull peripherals include the double-▷

▷ DPS 9000 URPs, and two channel pairs. The model requires two PRU0908s, PRU1208s, or a combination of the two.

The DPS 9000 Model 93 consists of three CPUs, two SCUs, two MMUs with a total of 256 megabytes of memory, three IOPs without channels, three IAUs without channels, one SCC cabinet, two SCC consoles, one SSP, two DPS 9000 URPs, and two channel pairs. The model requires two PRU0908s or PRU1208s, or a combination of the two.

The DPS 9000 Model 94 consists of four CPUs, two SCUs, two MMUs with a total of 256 megabytes of memory, four IOPs without channels, four IAUs without channels, one SCC cabinet, two SCC consoles, one SSP, two DPS 9000 URPs, and two channel pairs. The model requires two PRU0908s, PRU1208, or a combination of the two.

CENTRAL PROCESSOR AND MEMORY: The DPS 9000 Series, implemented with Current Mode Logic (CML) circuitry, uses a seven-stage pipeline architecture. CML is a variant of Emitter Coupled Logic semiconductor technology. DPS 9000 CML gate array features 1,000 or 4,000 gates per chip. CML multichip carriers employ 42 chips each and 12 modules per multilayered board. A DPS 9000 CPU features 26 multichip modules. To cool the chip modules, Honeywell Bull uses a self-contained water-cooling unit.

DPS 9000 models consist of a Central System Module (CSM), Input/Output Processor (IOP), System Control Center (SCC), System Support Processor (SSP), Unit Record Processor (URP), Power Supply Unit (PSU), Cooling Unit (CLU), and Interface Adapter Unit (IAU). The CSM consists of the CPU, System Control Unit (SCU), and Main Memory Unit (MMU).

To enhance throughput, the DPS 9000 Series uses a multi-level cache architecture. The systems use cache memories at the CPU level and at the system level. Each CPU also has an 128-kilobyte cache with a 3-nanosecond access time. The DPS 9000 Series itself has a main memory capacity of up to one gigabyte using one-megabit chip technology.

In addition to CPU cache, DPS 9000 features a system-level cache which keeps recently accessed data in a high-access-speed location. System-level cache is located within the SCU between the CPU and main memory. The system-level cache supports CPU and I/O processor buffering requirements and, along with the CPU cache, supports the pipeline architecture. A fully configured system features up to one megabyte of system cache.

The multistaged pipeline architecture permits a CPU to execute up to seven different instructions simultaneously in a single processor. A branch prediction system anticipates branching characteristics within code to keep the pipeline busy.

To augment numeric-intensive computing, DPS 9000 systems feature an integrated vector processor for handling repetitive, vector-type Fortran routines. Additionally, the vector processor can take advantage of an optional Kuck & Associates Fortran vectorizer, which automatically transforms program loops into appropriate vector instructions. The DPS 9000 processor features 63 vector mask instructions for vectorizing iterative loops that typify Fortran code.

A single Main Memory Unit holds from 128 to 512 megabytes of memory. The unit consists of up to eight memory ▷

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▷ density MSU3381/3383 disks, the triple-density MSU3391/3393 disks, and the CTS8504 Series Cartridge Tape Subsystem.

COMPETITIVE POSITION: Based on a claimed superiority in transaction processing, Honeywell Bull (HB) executives contend the DPS 9000 is now the most powerful general-purpose mainframe series available. The machines compete directly against the new IBM 3090 S models and the Amdahl 5990 models, which have a top-speed performance of more than 105 million instructions per second (MIPS). Since Honeywell Bull does not release MIPS figures, its claims of superiority are based on the sole performance measurement the company has released to date. The company said the machines can perform more than 1,000 transactions per second based on the TP1 benchmark. This, they claim, is more than twice the performance of an IBM 3090 Model 600S.

The new machines provide DPS 90 customers who need more performance with a long-awaited migration path. To date, the company has installed more than 200 DPS 90s, worldwide. In all likelihood, these existing DPS 90 accounts will be HB's best DPS 9000 prospects. The availability of more powerful hardware will help the company hold on to its existing base and discourage defections to IBM.

It remains doubtful that the new machines will attract many new accounts outside the current HB base. An IBM user, for instance, impressed with Honeywell Bull performance claims is not likely to switch from an IBM 3090 to a DPS 9000. Software conversion costs alone would make the move unthinkable for most.

The DPS 9000 Series sells for between \$5,856,400 and \$22,967,400, while IBM 3090 S models sell for between \$715,000 and \$11,754,000. IBM pricing doesn't include the cost of other required components. At the top end, a fully configured IBM Model 600S sells for about \$12.4 million. The two Amdahl 5990 models, which also compete in this performance range, sell for \$6,100,000 and \$11,300,000, respectively. □

▶ sections and a controller. Each MMU uses two-way interlacing. A fully configured system has two MMUs.

The System Control Center uses a Service Processor and a Master Console. The SCC supports system operation, error logging, and provides a user interface to the system.

The System Support Processor handles maintenance, monitoring, and automatic error reporting. The SSP automatically reports hardware errors to the Technical Assistance Center. The unit includes a maintenance console separate from the Master Console.

The DPS 9000 Unit Record Processor connects the Service Processor to a system printer and to the IOP. This allows the Service Processor to generate hard copy error logs and to load CPU, SCU, and IOP firmware.

The Power Supply Unit supplies power to the Central System Module. The Cooling Unit supplies liquid coolant to the CPU and SCU to dissipate heat. It uses a liquid coolant reservoir, two pumps, power equipment and controller, and a controller interface for the SSP.

PHYSICAL CHARACTERISTICS: Environmental requirements for the DPS 9000 Series are listed in the following tables:

	Width (in.)	Ht. (in.)	Depth (in.)	Wt. (lb.)
Honeywell Bull DPS 9000				
Central System Module (contains CPU, SCU, and MMU)	72.8	61.4	35.4	3,997
Power Supply Unit	35.4	61.4	35.4	NA
Input/Output Processor	65.0	61.4	35.4	1,872
Cooling Unit (liquid cooling)	55.1	61.4	31.5	1,698
Cooling Unit (optional air cooling)	90.6	61.4	31.5	2,138
System Control Center (cabinet)	31.5	52.6	29.9	794
System Support Processor	31.5	39.4	29.9	496
Interface Adapter Unit	58.6	73.0	32.5	1,495
DPS 9000 Unit Record Processor	31.5	52.6	29.9	573

NA—Not available.

Temperature Range 68° to 78° F (20° to 26° C)

Relative Humidity Range 40% to 60%
(noncondensing)

Heat Output (Btu/h.):	
Central System Module	18.5 to air; 40.3 to liquid
Input/Output Processor	33.1
Liquid-Cooling Unit	4.7
Air-Cooling Unit	47.2
System Control Center cabinet	2.1
System Support Processor	1.2
Interface Adapter Unit	15.9
DPS 9000 Unit Record Processor	5.3

Power Consumption:	
Central System Module	11.24kVA
Input/Output Processor	10.76kVA
Liquid-Cooling Unit	1.5kVA
Air-Cooling Unit	2.7kVA
System Control Center cabinet	0.99kVA
System Support Processor	0.35kVA
Interface Adapter Unit	5.0kVA
DPS 9000 Unit Record Processor	1.72kVA

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► **INPUT/OUTPUT SUBSYSTEM:** The Input/Output Processor handles I/O operations between the Main Memory Unit and peripheral subsystems. Up to two IOPs can be attached to a single System Control Unit (SCU). An IOP has a transfer rate of 96 megabytes per second. Each IOP supports up to 64 physical channels and up to 256 logical channels.

SOFTWARE: The DPS 9000 Series runs under the GCOS 8 operating system, the same operating system that runs on the company's other large-systems mainframes. The systems also use standard Honeywell Bull data base and transaction processing software and languages and compilers. Additionally, the company plans to make ORACLE, industry-standard data base software, available across all its GCOS 8-based products.

EQUIPMENT PRICES

		Purchase Price (\$)	Monthly Maint. (\$)	1-Year Lease (\$)	4-Year Lease (\$)
DPS 9000 SERIES PROCESSORS					
DPS 91	Central System Complex; includes a CPU, a System Control Unit (SCU), a Main Memory Unit (MMU) with 128 megabytes of memory, an Input/Output Processor (IOP) without channels, an Interface Adapter Unit (IAU) without channels, a System Control Center (SCC) cabinet, an SCC console, a System Support Processor (SSP), a DPS 9000 Unit Record Processor (URP), and one channel pair	5,856,400	7,320	406,795	302,731
DPS 92T	Central System Complex; includes two CPUs, two SCUs, two MMUs with 256 megabytes of memory, two IOPs without channels, two IAUs without channels, one SCC cabinet, two SCC consoles, an SSP, two DPS 9000 URPs, and two channel pairs	11,248,400	14,060	781,332	581,457
DPS 93	Central System Complex; includes three CPUs, two SCUs, two MMUs with 256 megabytes of memory, three IOPs without channels, three IAUs without channels, one SCC cabinet, two SCC consoles, one SSP, two DPS 9000 URPs, and two channel pairs	17,117,200	21,396	1,188,989	884,829
DPS 94	Central System Complex; includes four CPUs, two SCUs, two MMUs with 256 megabytes of memory, four IOPs without channels, four IAUs without channels, one SCC cabinet, two SCC consoles, an SSP, two DPS 9000 URPs, and two channel pairs	22,967,400	28,709	1,595,354	1,187,240
SYSTEM UPGRADES					
CPK8511	DPS 9000/91 to DPS 9000/92T	5,692,000	6,740	395,553	294,160
CPK8512	DPS 9000/91 with additional IOP to DPS 9000/92T	4,792,000	5,615	333,009	247,649
CPK8517	DPS 9000/92T to DPS 9000/93	6,168,800	7,336	428,687	318,801
CPK8518	DPS 9000/92T with additional IOP to DPS 9000/93	5,268,800	6,211	366,143	272,289
CPK8519	DPS 9000/93 to DPS 9000/94	6,150,200	7,313	427,394	317,840
CPK8520	DPS 9000/93 with additional IOP to DPS 9000/94	5,250,200	6,188	364,851	271,328
ADDITIONAL FEATURES AND OPTIONS					
CMM8501	Additional 128-megabyte Memory Module	640,000	800	44,455	33,083
MXU8502	Additional IOP without channels	900,000	1,125	62,515	46,523
CSU8501	Additional System Console	19,500	24	1,354	1,008
CSU8502	Remote System Console	21,500	26	1,493	1,111
CLU8501	Chilled Water-Cooling Unit	200,000	250	13,892	10,338
CLU8502	Chilled Air-Cooling Unit	200,000	250	13,892	10,338
MXU8510	Additional IAU without channels	56,000	150	3,889	2,894
MXF8521	Channel Expansion; 7 to 14	3,000	10	208	155
MXF8523	Power Expansion	5,500	5	382	284
MXF8527	Power Sequencer Channels; 1 to 7	3,500	5	243	180
MXF8528	Power Sequencer Channels; 8 to 14	2,800	5	194	144
MXK8524	GPA Exchange Feature	1,200	5	83	62