

Cii Honeywell Bull Series 60, Model 61/DPS

MANAGEMENT SUMMARY

Designed to serve either as small business systems or distributed processing systems, the 61/DPS systems offer a wide choice of configurations and operating modes, ranging from a single-terminal system up to a 16-terminal system that can support batch, transaction processing, time-sharing, and data communications.

Although directly descended from the Level 61 systems introduced in 1974, the 61/DPS systems are so different in hardware and software that this link to the past is important only for two reasons: compatibility and a firm foundation of experience. Compatibility, of course, is of interest only to users of earlier Level 61 models, but the fact that five years of user experience have gone into the evolutionary design of the 61/DPS is of interest to all potential users, particularly first-time users.

The 61/DPS is internally interesting because of its dual-processor architecture, disk cache memory, and other unusual features, but its people-oriented features are of more interest to users. CII-HB has designed the 61/DPS to be "user friendly," resistant to unauthorized use, resilient against errors and power failures, and adaptable to changing user needs.

A basic 61/DPS system includes a microprogrammed Common Resource Processor (central processor) with 64K bytes of memory, a microprogrammed Distributed Resource Processor (front-end processor) with 24K bytes ➤

The French-built 61/DPS systems are the smallest members of the broad Series 60 family marketed by CII-HB and Honeywell Information Systems. Extremely versatile, they can serve as small business systems or as elements in a distributed processing network. Prices range from 147,800 FF for a basic system to 482,700 FF for a medium-sized system, not including software.

CHARACTERISTICS

MANUFACTURER: Cii Honeywell Bull, 94, avenue Gambetta, B.P. 33, 75960 Paris, Cedex 20, France. Telephone 360.02 22. Telex 220 898 F. CII-HB has offices in 36 countries.

MODELS: Series 60, Model 61/DPS.

DATE ANNOUNCED: The 61/58 and 61/60 were announced in April 1974, the 61/40 in December 1975, the 61/60-2 in September 1976, and the 61/DPS in February 1979. Only the 61/DPS is currently actively marketed.

DATA FORMATS

BASIC UNIT: 8-bit byte (plus parity bit). Each byte can represent 1 alphanumeric character, 2 packed BCD digits, or 8 binary bits.

FIXED-POINT OPERANDS: Arithmetic operations are performed on data held in registers, in packed decimal form. ➤



This large 61/DPS system includes three disk drives with a total capacity of 172.8 megabytes, the main enclosure containing the two processors with their associated memories and an integrated flexible disk drive, an 800 lpm system printer (rear), and the central workstation with a 2,000-character display and detached keyboard. This configuration can support up to 16 local or remote workstations and printer terminals plus synchronous communications.

Cii Honeywell Bull Series 60, Model 61/DPS

▷ of memory, a console keyboard/display, 11.52 million bytes of fixed/removable disk storage, and a 40 character per second printer.

A more typical 61/DPS system might include 96K bytes of main memory, 56K bytes of front-end memory, a console, four keyboard/display workstations, two remote printers, 115.2 million bytes of disk storage, and a 300 line per minute system printer. Such a system can be expanded up to a total of 16 workstations and remote printers, up to 230 million bytes of disk storage, and up to two system printers.

The 61/DPS systems can be programmed in COBOL, FORTRAN, or BASIC. Autoform, a multi-lingual COBOL preprocessor, allows non-technical users to develop their own interfaces with the system, and BASIC allows non-technical users to write their own programs with a minimum of training. CII-HB also offers packaged software for sales order processing, distribution inventory management, inventory management, production scheduling and control, and other applications. These packages can be modified, often by the user, to provide input and output formats that meet the user's requirements.

System control and file management is provided by GCOS 61/DPS, a subset of the General Comprehensive Operating System used on all Series 60 systems.

The Level 61 family now consists solely of the 61/DPS, announced in February 1979. The earlier 61/58 and 61/60, announced in April 1974; the 61/40, announced in December 1975; and the 61/60-2, announced in September 1976, are no longer actively marketed.

"DPS" stands for "Distributed Processing System" and indicates the computer is designed to fit into CII-HB's Distributed Systems Environment framework for computer networks. The goal is to give every workstation, within authorization limits, automatic access to the entire network. A user will be able to request data or send messages without knowing where the data is stored or how the message will be routed.

Today, however, most computer/computer communications consist of a single link, and a 61/DPS can be equipped with a synchronous line adapter that allows it to communicate with another Series 60 system, with a CII-HB IRIS system, or with an IBM mainframe. The maximum transmission rate is 9600 bits per second. Transmissions are transparent to the programmer, who treats messages as though they were records being read from or written to a local peripheral device.

Through the use of various combinations of dedicated, switched, and multipoint lines, a 61/DPS system can serve as the host to a network of local and remote terminals, including displays, printers, teleprinters, key-to-diskette units, and intelligent terminals. ▷

▶ A single-register field is 5 bytes long and can hold up to 9 digits and sign; a double-register field is 10 bytes long and can hold up to 18 digits and sign. Other operations, including move, compare, pack, and unpack, are performed on variable-length fields ranging from 1 to 99 bytes.

FLOATING-POINT OPERANDS: 6 bytes, consisting of a packed decimal 9-digit mantissa, 4-bit sign and implied decimal point, and an 8-bit exponent.

INTERNAL CODE: ASCII.

MAIN MEMORY

TYPE: Metal oxide semiconductor (MOS/EDAC) 16K-bit chips.

CYCLE TIME: 700 nanoseconds per 1-byte access.

CAPACITY: 65,536 bytes for single-terminal systems; 98,304 bytes for multi-terminal systems.

CHECKING: An Error Detection and Automatic Correction (EDAC) system provides automatic correction of single-bit errors and detection of all double-bit and most other multiple-bit errors.

MEMORY PROTECTION: The user-accessible instruction set operates with indexed decimal addresses that limit access to a 10,000-byte paged area of memory. The supervisor, when running in master mode, operates with binary addresses that can reference any area of memory.

RESERVED STORAGE: All of memory is reserved for system use except for a 16K-byte time-shared area.

CENTRAL PROCESSORS

Designed around dual, microprogrammed processors with their own memories, a 61/DPS system is functionally divided into a "central" processor and a "front-end" processor. The central processor, called the Common Resource Processor (CRP), includes integrated adapters for the disk drives and a line printer. All other input/output activity is handled by the Distributed Resource Processor (DRP), which communicates with the CRP via two, 3000-byte "mail boxes." As necessary, the DRP edits and reformats input and output, relieving the CRP of this task. (A full description of the DRP appears in the Communications Control section of this report.)

A single-bus processor with a transfer rate of 1.4 megabytes per second, the CRP has two read-only memories (ROMs). The micro-ROM contains the code for the instruction set, index sorting, and diagnostics. The macro-ROM contains routines for diagnostics, memory dumps, and system initialization. Main memory is partitioned into a system area, a user area, a cache memory for disk files, and one or two multi-line buffers for one or two line printers.

REGISTERS: The Level 61 has 100 5-byte registers located in a reserved area of main memory.

INSTRUCTION REPERTOIRE: 114 instructions.

CONTROL STORAGE: 24K bytes (8192 24-bit words) of read-only memory with a cycle time of 350 nanoseconds per 24-bit word. There is also a macro-ROM of 24K bytes with a cycle time of 700 nanoseconds per byte.

PROCESSOR MODES: The processor operates in master and slave modes. User instructions can only be executed when the processor is in slave mode, and some instructions, reserved to GCOS, can only be executed when the processor is in the master mode. ▶

Cii Honeywell Bull Series 60, Model 61/DPS

➤ ARCHITECTURE

An unusual "division of labor" approach enables the 61/DPS to run up to 17 programs concurrently without complex—and time consuming—scheduling. The "back-end" Common Resource Processor (CRP) does the data processing. On 61/DPS systems, the CRP's memory is permanently divided into special purpose areas, simplifying memory management. The instruction set is in a micro-ROM, the system macro instructions in a macro-ROM, and system software and user programs each have their own area. Only one user program is resident at a time. On the larger 61/DPS systems, there are also areas reserved for a disk cache to reduce the need for physical seeks and for 20-line print buffers to keep the system printers running at maximum speed with minimum attention.

The CRP communicates with the front-end Distributed Resource Processor (DRP) via a "mail box" system, so the two processors do not have to be synchronized. The CRP fetches orders and data from an input buffer and places messages and data in an output buffer.

The DRP's memory also is divided into a micro-ROM, a macro-ROM, system memory, and a series of buffers, one for each attached terminal and communications line. The DRP communicates with the users and the network, keeps track of input/output device characteristics, pre-processes input data from the terminals and post-processes output data from the CRP.

Data security is provided by user identification codes, passwords, and, optionally, badge readers. A user known to the system is not automatically given access to all programs and data. Each user request is checked against a list of activities that user is authorized to perform, and access is granted only when appropriate.

Data integrity is maintained by error detection and correction circuitry, by locks that prevent two users from trying to update the same record at the same time, and by automatic checkpoint/restart facilities. In addition, a series of diagnostic routines executes automatically when the system is turned on in the morning, and the operator is warned if any faults are detected.

COMPATIBILITY

All 61/DPS systems are compatible with each other and upward compatible with the earlier Level 61/40 and 61/60 systems. Users moving in the future from 61/DPS systems to the larger Level 62, 64/DPS and 66/DPS systems can transfer their COBOL and FORTRAN programs by recompiling them.

COMPETITIVE POSITION

The 61/DPS systems are viable alternatives to the IBM System/32, System/34, and smaller configurations of the System/38.

➤ **INTERRUPTS:** Interrupts are automatically handled by microprograms.

COMPATIBILITY FEATURES: User software can be transferred from a 61/DPS to a Level 62 or Level 64 system by using a translator that converts source programs from 61/DPS COBOL to Level 62 or Level 64 COBOL. Files can be transferred without modification.

INPUT/OUTPUT CONTROL

I/O CHANNELS: The 61/DPS central processor has one channel that links it to the disk controller, the printer, and the Distributed Resource Processor. Transfers between memory and the system printers and the DRP employ direct memory access logic.

SIMULTANEOUS OPERATIONS: The central processor, the disk controller, and the Distributed Resource Processor operate independently and simultaneously.

CONFIGURATION RULES

A minimum 61/DPS system consists of a central processor with 64K bytes of memory, 11.5 million bytes of fixed and removable disk storage, and a Distributed Resource Processor with 24K bytes of memory, a synchronous line adapter, a keyboard/display workstation, a flexible disk drive, and a 40 character/second printer.

Multi-terminal systems (2 to 16 terminals) have 96K of main memory and the Distributed Resource Processor has 24K or 56K of main memory. Options include up to 230.4 megabytes of disk storage and system printers with speeds up to 800 lines per minute.

MASS STORAGE

MSU0323 MASS STORAGE UNIT: Providing either 11.5 megabytes or 23 megabytes of storage, the MSU0323 has one fixed disk and one removable disk cartridge. An 11.5-megabyte unit can be upgraded to 23 megabytes by adding the MSA1621 addressing feature. Average access times, including rotational delay, are as follows:

CAPACITY	TYPE	ACCESS TIME
5.76MB	Fixed	22.3 ms.
5.76MB	Removable	33.3 ms.
11.5MB	Fixed	25.3 ms.
11.5MB	Removable	38.3 ms.

The transfer rate is 1.2 megabytes per second. Only one MSU0323 can be attached to a 61/DPS system.

MSU0333/4/5/6 MASS STORAGE UNITS: Each drive uses a disk pack with 5 recording surfaces and a capacity of 14.4, 28.8, or 57.6 megabytes. The MSU0333 has two spindles, the add-on MSU0334 and MSU0335 have one spindle each, and the add-on MSU0336 has two spindles. The minimum configuration is two 14.4-megabyte drives and the maximum configuration is four 57.6-megabyte drives. Average access times, including rotational delay, are as follows:

CAPACITY	ACCESS TIME
14.4MB	26.3 ms.
28.8MB	33.3 ms.
57.6MB	38.3 ms.

The transfer rate is 1.2 megabytes per second. Transfers can be linked from track to track within the same cylinder and between contiguous cylinders in the same volume. Correction of read, write, and positioning errors are handled and

Cii Honeywell Bull Series 60, Model 61/DPS

➤ Because they are direct descendants of similar systems, the 61/DPS systems offer thoroughly tested and field-proven software.

The broad range of Series 60 systems provides users with an almost unlimited growth path, and the worldwide CII-HB/Honeywell Information Systems organization assures continued maintenance and support for the systems.

USER REACTION

In January 1978, Datapro surveyed 14 Level 61 users in France, Germany, and Switzerland by mail. Four usable responses—one each from France and Germany and two from Switzerland—were received.

The German user had the smallest system, a 61/40 Monostation with 18.4 million bytes of disk storage. Installed for six months, the system was rented from CII-HB. Under system strengths, the user listed easy conversion and easy operation. Under disadvantages, he said that there weren't enough system messages and objected to the fact that interrupt messages were not displayed until the console was switched from input mode to console mode. With three exceptions, he rated the system "good" in all categories. He rated "technical support," "compilers," and "ease of programming" as "fair."

The French user had a 61/60-2 with 46 million bytes of disk storage and three remote batch terminals. Installed for six months, the system was on third-party lease. With two exceptions, he rated the system "good" in all categories. He did not rate "ease of conversion" because he had not made a conversion, and he rated the COBOL compiler as "fair."

The first Swiss user had a 61/60 with 46 million bytes of disk storage and three interactive terminals. Installed for nine months, the system was rented from CII-HB. This user was the only one who was writing programs in BASIC as well as COBOL. Under system strengths, he listed simplicity of use, automatic program segmentation, and multiprogramming. Under disadvantages, he listed slow compilation. He rated the system "excellent" in two categories and "good" in five other categories. He rated "reliability of mainframe," "technical support," and "compilers" as "fair." He did not rate "ease of conversion."

The other Swiss user had the largest system, a 61/60-2 with 69 million bytes of disk storage and 16 interactive terminals. Installed for 16 months, the system was purchased. Very happy with the system, the user noted that he was running programs of more than 100K bytes from each of 12 terminals "all day long." He was the only one of the four who was running a data base management system. Under system strengths, he listed easy operation and programming and excellent restart. Under disadvantages, he listed slow compiling of large (100K) COBOL programs. He rated the system "excellent" in seven categories and "good" in other categories.

➤ logged by the disk controller's firmware, usually without help from the central processor. Spare track handling also is firmware controlled.

Recording is at 6038 bits per inch, 1440 bytes per track. Each surface has 200, 400, or 800 tracks plus 5, 10, or 20 spare tracks, respectively.

INPUT/OUTPUT UNITS

Only the system printer attaches to the central processor; all other I/O devices attach to the Distributed Resource Processor and are discussed in the Communications Control section of this report.

PRU0040 SERIAL PRINTER: A table-top, 7 x 7 matrix printer, the unit operates at 40 characters per second using fanfold forms ranging in width from 4 to 15 inches and in depth from 3 to 16 inches. Printing is 10 characters per inch and 6 or 8 lines per inch. Vertical format is software controlled. Maximum line length is 132 positions. The unit can be ordered with either the standard 64-character ASCII upper case set or with a national character set. Options include an automatic front feed for pre-cut forms, a pedestal, and a paper stacker.

PRU0041 SERIAL PRINTER: This is a 120 character per second version of the PRU0040.

PRU0044 SERIAL PRINTER: This is a microprocessor controlled, bi-directional version of the PRU0040 with a printing speed of 160 characters per second.

PRU0107 LINE PRINTER: A buffered, belt printer operating at up to 100 lines per minute, the unit prints 10 characters per inch and 6 lines per inch. Maximum line length is 132 positions. Form widths can range from 3 to 15 inches and form depths to 20 inches. Skipping, at 13.3 inches per second, is controlled by an 8-channel paper tape loop. Various national and international character sets are available; rated printing speed is based on the use of a 63-character set. Connection to the central processor is via the CPA1622 addressing feature.

PRU0207 LINE PRINTER: This is a 180 line per minute version of the PRU0107.

PRU0307 LINE PRINTER: This is a 300 line per minute version of the PRU0107.

PRU0441/0641/0841 LINE PRINTERS: These units operate at 400, 600, and 800 lines per minute, respectively, and the lower speed units can be upgraded to the higher speeds. Printing is 10 characters and 6 or 8 lines per inch. The standard line length of 120 positions can be changed to 136 positions. Vertical format is software controlled. Forms can range in width from 4 to 19 inches and in depth from 4 to 16 inches. The printer uses interchangeable print belt cartridges of 480 character slugs, and custom character sets of up to 240 characters can be ordered for special applications. When cartridges are changed, the image of the new print belt is loaded into the printer interface by the system software. Rated printing speeds, based on the use of a 64-character set, decrease when larger character sets are used. Connection of the printer to the central processor is via a CPA1623 addressing feature.

COMMUNICATIONS CONTROL

DISTRIBUTED RESOURCE PROCESSOR: An integral part of the 61/DPS, the Distributed Resource Processor (DRP) provides support for the central workstation (console), the system diskette drive, all terminals, and all communications lines. Designed around a single bus with a transfer rate of 1.5 megabytes per second, the micro-

Cii Honeywell Bull Series 60, Model 61/DPS

▷ The following table summarizes the ratings given by the four users.

	Excellent	Good	Fair	Poor	WA*
Ease of operation	2	2	0	0	3.5
Reliability of mainframe	1	2	1	0	3.0
Reliability of peripherals	0	4	0	0	3.0
Maintenance service:					
Responsiveness	1	3	0	0	3.3
Effectiveness	0	4	0	0	3.0
Technical support	0	2	2	0	2.5
Manufacturer's software:					
Operating system	1	3	0	0	3.3
Compilers	1	0	3	0	2.5
Application programs**	—	—	—	—	—
Ease of programming	1	2	1	0	3.0
Ease of conversion	1	1	0	0	3.5
Overall satisfaction	1	3	0	0	3.3

*Weighted Average on a scale of 4.0 for Excellent.

**None of the users had acquired application software from CII-HB.

These ratings indicate a good level of user satisfaction in all categories except technical support and compilers. Note, however, that these ratings were pulled down by the three users who had had their systems for less than a year—a very short time—and even they rated their overall satisfaction as “good.” The fourth user, with 16 months of experience, was very happy with his system. □

▶ programmed DRP has either 24K or 56K bytes of 680-nanosecond memory and two read-only memories (ROMs). A micro-ROM of 8K bytes (4096 16-bit words) contains the code for the processor's 110 instructions and routines for cross-checking with the central processor. Cycle time is 100 nanoseconds per word. A macro-ROM of 4K bytes contains diagnostic and system initialization routines. Cycle time is 680 nanoseconds per byte.

Communications between the DRP and the central processor take place over a microprogrammed bus under the control of the DRP. Bidirectional communications can take place simultaneously at a rate of 50,000 bytes per second. Messages and data awaiting transfer are stored in a 3000-byte transmission buffer and incoming messages and data arrive in a 3000-byte reception buffer.

CENTRAL WORKSTATION: Used both to control the system and to communicate with other workstations, the console consists of a display of 24 lines of 80 characters and a movable keyboard with alphanumeric, numeric, and function keys. Data is transferred between the display and the DRP's memory by direct memory access circuits.

DISKETTE DRIVE: A standard feature, the drive is used for loading system software. Optionally, the drive can be used as an input/output device for batch programs. Diskettes are in IBM-compatible format recorded in EBCDIC and have a formatted capacity of 243K bytes. A disk/diskette conversion utility is supplied with the I/O option.

SYNCHRONOUS LINE: The 61/DPS has one synchronous line that can be used for communicating with a network, with a host computer, or with intelligent terminals. The transmission rate can be at up to 9600 bps when no asynchronous terminals are operating and up to 4800 bps when asynchronous terminals are active. Available protocols includes BSC 2780 for connection to 61/DPS, Level 62, and 64/DPS systems, RC 115 for 66/DPS systems, and BSC2780/3780 for IBM 360/370 systems. When CII-HB KDS key-to-diskette systems are connected, the VIP Master

protocol is used, and data is transferred from the KDS diskette to the 61/DPS disk subsystem.

ASYNCHRONOUS LINES: Up to four line adapters can be connected to the DRP, and each adapter can support four lines, providing up to a total of 16 lines. Line transmission rates can be up to 9600 bits per second.

DTU7172 KEYBOARD/DISPLAY UNIT: Currently the standard workstation for the 61/DPS, the DTU7172 displays 25 lines of 80 characters each. Features include half-brightness, reverse video, blinking, underlining, and blanking. The movable alphanumeric keyboard is available in various national formats. Selectable transmission rates range from 110 to 9600 bits per second. Options include a receive-only printer and a badge reader.

TTU8124 TELEPRINTER: Available in receive-only and in send/receive versions, the unit prints 132-position lines at 10, 20, or 30 characters per second. The transmission rate can be 110, 200, or 300 bits per second. An automatic front feed for single-sheet documents is available as an option.

TTU8126 TELEPRINTER: A faster version of the TTU8124, this unit prints at 120 characters per second and connects to a 1200 bit per second line.

OTHER TERMINALS: Also available for the 61/DPS are the DTU7170 and DTU7171 workstations, the TTY33 and K33 teleprinters, and the TN300 and TN1200 teleprinters.

SOFTWARE

OPERATING SYSTEM: All 61/DPS systems run under GCOS 61/DPS, a subset of the General Comprehensive Operating System (GCOS) used on most Series 60 systems. On 61/DPS systems, the operating system is physically divided between the Common Resource Processor (CRP) and the Distributed Resource Processor (DRP), creating two separate but cooperating computer systems.

MULTIPROGRAMMING: A single-workstation system can run a batch program, a compilation, and a transaction program concurrently. Multi-workstation systems can concurrently run up to 17 programs, including a batch program, a compilation, and a print program. Scheduling is handled by the DRP, which tells the CRP what program to run next. Only one program is resident at a time in the 16K-byte user memory; when it completes its task or pauses for an I/O operation, it's swapped out and replaced by another program brought in from disk. Only the contents of the registers (for interrupted programs) and variable data need be stored during swapping because program code is never altered during execution.

DISK CACHE MEMORY: Data written to disk is stored in 5,760-byte output buffers until they are full (10 writes), is sorted to minimize head movement, and then is transferred to disk. Input buffers of 28,800 bytes hold the data most recently brought in from disk. When a program issues a disk-read instruction, the file management system looks first in the I/O buffers for the data, reducing the number of actual disk accesses that have to be made.

DISK I/O MACROS: A set of macro-instructions, resident in a 12K block of the CRP's memory, handles the disk cache memory and all disk accesses. During compilation, disk read and write instructions in application programs are replaced by calls to the appropriate disk I/O routines.

SPOOLING: Under control of the Printer Management System (PMS), output from any one job (usually a batch program or a compilation) can be sent to a first-in/first-out spool file on disk. Printing can be concurrent with processing or scheduled for a later time, and the output of one job

Cii Honeywell Bull Series 60, Model 61/DPS

► can be spooled while the previously spooled output of another job is printed. A restart feature allows the operator to reprint output from the beginning or from a specified page. PMS allows the printer to run at its rated speed by transferring up to 20 lines at a time to a print buffer in memory.

FILE MANAGEMENT: The 61/DPS uses an "indexed random" file structure called Multi Logic Data Store (MLDS). Variable-length records composed of fixed-length elements are stored, element by element, in the first available physical disk spaces within a specified volume. The address of each main element is stored in the primary index, and each element holds the address of the next related element. Each file has a primary index that is automatically created and maintained (including sorting) and can have up to 10 secondary indexes. Each index key can be up to 30 bytes in length (30 alphanumeric or 60 packed numeric characters). This File Management System (FMS) allows records to be processed sequentially without pre-sorting. Fast index sorting by microprogram is automatic for the primary index each time it is altered; sorting of secondary indexes occurs on request. Secondary index keys can point either to main elements or to other elements within records.

Management of the physical disk files is handled by the Volume Management System (VMS) which allocates space, controls the organization of files and libraries, and does the housekeeping. A volume is a collection of file areas, each area a multiple of 20 or 100 sectors. Details of files, volumes, libraries, and users are stored in the General System Catalog. During a system run, VMS checks the catalog to be sure the correct volumes are on-line.

Each volume contains a Volume Reference Table containing an entry for each file in the volume. Application programs use the catalog to find the correct volume and the table to locate the correct file within the volume. For each application, a library can be created, grouping together the files, indexes, and programs for that application.

COMMUNICATIONS MANAGEMENT: Running in the Distributed Resource Processor (DRP), the Communication Management System (CMS) contains routines for handling links to asynchronous workstations, the central workstation, remote computers, and intelligent workstations connected in synchronous mode.

Each terminal connected to the DRP has an input and an output buffer. CMS handles the passing of messages between each workstation and the application program being executed by that workstation, and maintains the waiting queue. Communications procedures, the interrupt system, and priorities are maintained automatically by CMS and are transparent to the programmer.

Autoform, an optional extension of GCOS 61/DPS, allows users to define screen and teleprinter formats and also handles the preprocessing of data before it is sent to an application program. Using the interactive Formatter, the user develops an image of the form desired and then describes the data exchanged between the workstation and the application program, including any checks or calculations to be made.

The output of the Formatter is a COBOL Data Division which is inserted in the application program by a COPY statement during compilation. At execution time, an Interpreter handles the transfer of data between the workstation and the program. When the program issues either a read or a write instruction, the instruction contains the name of a descriptor. The Interpreter then retrieves the appropriate form from disk and places it in the workstation's buffer, where it remains until a different form is requested. Data passing between the workstation and the application program can be pre and postprocessed in the DRP, thus relieving the CRP of this burden.

LANGUAGES: CII-HB offers COBOL and FORTRAN compilers and a BASIC interpreter for the 61/DPS. Compilations run in one job slot as a low priority batch job and do not interfere with other system activities. BASIC is available from up to eight workstations concurrently while other applications are being handled by the remaining workstations.

SEGMENTATION: When necessary, programs are automatically segmented to make optimum use of main memory. COBOL segments are based on natural section divisions, and the programmer can define segments if he wishes. During execution, commonly used segments are kept in memory and other segments are swapped in as needed.

JOB CONTROL: Able to converse with users in up to three different national languages at one time, the Execution Control Language (ECL) provides the user's interface with the system. ECL functions include job loading and monitoring, file creation and maintenance, file copying including disk/diskette transfers, and compilation. In the conversational mode, ECL displays multiple levels of menus. By selecting options, the user describes to the system the task to be accomplished. When in doubt, the user can request that an explanation of an option be displayed.

In direct mode, the user specifies by keying in a code which application is to be run. For frequently run jobs, the ECL commands can be stored and called up by keying in the name of the application.

SECURITY: The Security Management System (SMS) limits access to the system, handles file access conflicts, and provides for warm restarts.

SMS limits user access at each step by checking a user's identification, his password (optional), and his authorization to use a specific workstation, to run a specific program, and to access specific files. Authorization information is stored in the general system catalog and is referenced by SMS.

During updating, files can be locked at the file or element level by SMS until the update is completed. Other requests are queued. Optionally, the user can specify that a specific transaction program remain in main memory until execution is completed.

An automatic checkpointing system, based on the time-sharing mechanism, provides automatic restart after a system failure. Restart is at the point of the last completed transaction. The only data lost are messages or information being keyed in by workstation operators when the failure occurred; operators are automatically requested to rekey the data.

APPLICATION PROGRAMS: Packaged programs available for Level 61 systems include Sales Order Processing (order entry, billing and shipment, inventory accounting, and sales analysis), Distribution Inventory Management (data base management, inventory accounting and inventory management), Inventory Management System (inventory reporting, bill of materials processing, and material requirements planning), and Production Scheduling and Control (production data management, capacity requirements planning, and production control reporting). In addition to these packages, which are available everywhere the Level 61 is sold, locally developed packages are available in individual countries. To obtain a list of all the packages available in your country, contact the local CII-HB or Honeywell Bull office.

PRICING

Pricing and policies may vary slightly from country to country, but the information below, although specifically ►

Cii Honeywell Bull Series 60, Model 61/DPS

► applicable only to France, may be considered a guide to CII-HB's worldwide marketing of the Level 61.

SOFTWARE: All system and application software is separately priced. Users are charged a monthly license fee. Extra charges are also levied for customer services, such as education, program development, system design, implementation and conversion, and network design.

CONTRACT TERMS: 61/DPS equipment is available under purchase, rental, leasing, and full-payout-leasing plans.

Under the purchase plan, one year of maintenance on the central processing unit and three months on peripheral devices are provided without additional charge. Maintenance beyond these initial periods is provided under a separate contract.

The rental plan entitles the user to 182 hours of central processor usage per month and includes maintenance in the monthly fee. The user pays 10 percent of 1/182 of the basic monthly fee for each additional hour of usage beyond this 182 hour period.

The leasing plan entails a fixed equipment fee and a separate maintenance contract that allows maintenance rates to vary on a quarterly basis. Five and six-year leases are available. For a five-year lease, the monthly charge including maintenance is approximately 93 percent of the monthly charge under the rental plan. For a six-year lease, the charge is approximately 89 percent of the rental plan charge.

The full-payout-lease (FPL) is available as a five or six-year plan. ■

EQUIPMENT PRICES

<u>Configuration</u>	<u>Purchase Price (FF)</u>	<u>Monthly Rental* (FF)</u>	<u>Monthly Maintenance (FF)</u>
61/DPS SINGLE-STATION SYSTEM 64K CRP, 24K DRP, Central Workstation, 11.52 megabytes of fixed/removable disk storage, 40 cps printer	147,800	5,050	1,100
SMALL 61/DPS MULTI-STATION SYSTEM 96K CRP, 56K DRP, Central Workstation, 23 megabytes of fixed/removable disk storage, 160 cps printer, two DTU7172 workstations	240,800	8,550	1,900
AVERAGE 61/DPS MULTI-STATION SYSTEM 96K CRP, 56K DRP, Central Workstation, 115.2 megabytes of disk pack storage, 300 lpm printer, four DTU7172 workstations, two TTU8124 teleprinters	482,700	17,500	3,800

SOFTWARE PRICES

	<u>Monthly Fee (FF)</u>
GCOS 61/DPS with COBOL	850
GCOS 61/DPS with COBOL and Autoform	950
GCOS 61/DPS with FORTRAN	1,140
GCOS 61/DPS with COBOL and BASIC	1,140

*Rental includes maintenance.