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Honeywell Series 60, Level 61

MANAGEMENT SUMMARY

In October 1974, Honeywell Information Systems announced the availability in the United States of its Series 60 Level 61 processors, which had previously been offered only in Europe. With Honeywell's earlier introduction of the more advanced Level 62 systems, in April 1974, the total number of small-scale Series 60 systems released in the United States now stands at four: the 61/58, 61/60, 62/40, and 62/60.

Two versions of the Model 61/58 are available: the 61/58 Batch System for direct entry and batch processing, and the 61/58 Multiworkstation System for concurrent processing of up to four communications programs with one batch job.

Obviously similar to the earlier Honeywell Model 58, the Level 61 systems are, in fact, enhanced versions of the Model 58. The enhancements are most notable in the areas of additional data communications capabilities, increased mass storage facilities, and new programming languages. Very reasonably priced "retrofit" kits are available for conversion of Model 58 systems to Level 61 configurations.

The Model 61/58 is a disk-oriented system with 5,120 or 10,240 8-bit bytes of 1.2-microsecond main memory. Its memory capacity can be expanded through the addition of 16,384 to 65,536 bytes of Extended Memory Store, a novel MOS memory unit designed primarily to store segments of large programs for transfer into main memory upon request. Integrated peripheral controls allow ➢

The two Level 61 systems are the entry-level members of Honeywell's broad Series 60 computer family. The 61/58 is available in two configurations, as a batch system or as a multi-workstation system, with basic purchase prices of $66,590 and $91,400, respectively. The 61/60 is offered in only one configuration, a transaction processing system with a basic purchase price of $90,340.

CHARACTERISTICS

MANUFACTURER: Honeywell Information Systems, Inc., 200 Smith Street, Waltham, Massachusetts 02154. Telephone (617) 890-8400.

MODELS: Level 61 Models 61/58 and 61/60.

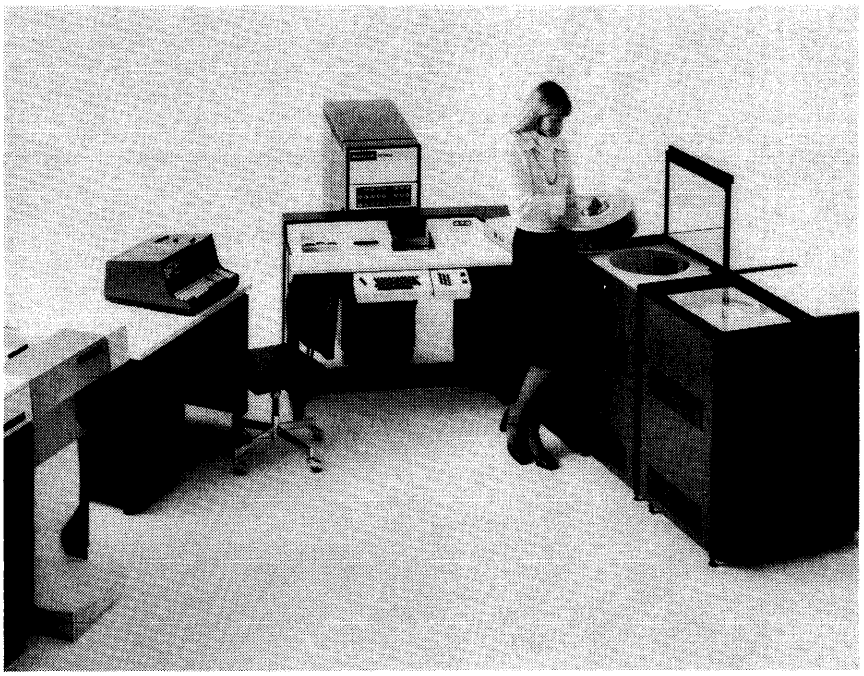
DATA FORMATS

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

FIXED-POINT OPERANDS: Arithmetic operations are performed on data held in registers, in packed decimal form. 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 19 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: None.

INSTRUCTIONS: Range from 1 to 8 bytes in length. Arithmetic instructions are 3 bytes long, consisting of a 1-byte operation code and two 1-byte register addresses. ➤



The Model 61/60 Transaction Processing System in its minimum configuration consists of the central processor with 10,240 bytes of memory; a front-end processor with its related 8K-byte memory, CRT display, keyboards, and two cassette tape units; a 100-lpm, 128-position printer; a card console consisting of a 100-cpm card reader, numeric keyboard, alphanumeric keyboard, and 10-digit display; and a mass storage subsystem with 46 megabytes of disk storage.

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- A variety of line printers and card input/output units for standard 80-column cards, plus an optional optical mark reading capability.

Magnetic tape capabilities are limited to dual software-loading cassette units, which are standard on the Model 61/60. These tape units run at 7 inches per second, and their specifications include a recording density of 800 bits per inch, phase encoding, and a transfer rate of 700 bytes per second.

With the Series 60 announcement in April 1974, Honeywell joined the ranks of "unbundled" computer manufacturers (notably IBM) by establishing separate pricing for most of its software. Monthly rental for Level 61 systems includes the operating system (incorporating basic job-management and file-management systems) and programming tools such as link editors, debugging aids, job control language, and conversion aids. Language processors and utilities, applications packages, and communications software are separately priced, along with services such as program development, network design, education, and additional sets of documentation.

Software support is provided by subsets of Honeywell's proven GCOS operating system. Honeywell supplies three versions of GCOS for Level 61 systems, each oriented toward a specific type of processing environment. Model 61/58 users can choose either a single-job-stream version or one that permits simultaneous execution of one batch program and up to four terminal-oriented programs, with the batch program receiving processing priority. Model 61/60 systems, on the other hand, run under a GCOS version that gives up to 16 conversational terminal programs priority over a single batch program. Level 61 GCOS provides automatic program segmentation and swapping between main memory and disk storage or extended memory.

Programming languages are currently limited to Mini-COBOL and COBOL-68 for Models 61/58 and 61/60, plus BASIC for Model 61/60 only. A more powerful COBOL-74 compiler has been announced for future availability.

The Level 61 computers are accompanied by a repertoire of preprogrammed applications packages that should contribute substantially to easing the installation process for first-time computer users. These include inventory reporting, bill of materials, sales order processing, student scheduling, hospital accounting, and financial management program products.

As the upgrade systems for Honeywell's customer base of Model 58 users, the Level 61 processors offer a high degree of compatibility with the Model 58. All applications programs previously released for the Model 58 will run on Level 61 systems, and the GCOS Level 61 Batch and Multiworkstation software systems are being released to run on currently installed Model 58 systems (although the Model 58 was withdrawn from the currently marketed Honeywell product line with the Level 61 result exceeds permitted limits. There are four program registers consisting of a total of eight bytes. The two-byte Program Address register stores the address of the next instruction to be executed; the two-byte Program Return Address register stores the address of the next sequential instruction after a branch; the two-byte Interrupt Address register stores the start address for a recovery routine; and the two-byte Interrupt Return Address register stores the address of the next instruction to be executed in an interrupted program.

ADDRESSING: No indirect addressing is available.

INSTRUCTION REPERTOIRE: 78 instructions, including 7 arithmetic commands, 31 data movement commands, 4 jump commands, 5 comparison and logical commands, 2 shift commands, 3 translate commands, 3 loading and debugging commands, 19 input/output commands, and 4 multiprogramming commands. Arithmetic operations are performed on signal decimal operands of 9 or 19 digits (5 or 10 bytes). Also provided are efficient facilities for data movement, comparisons, character insertion, logical AND and OR, packing, unpacking, conditional branching, and code translation.

INSTRUCTION TIMINGS: All timings are in microseconds.

Add two 9-digit numbers:	115
Add two 19-digit numbers:	160
Multiply 9 digits by 9 digits:	5,500
Divide 18 digits by 9 digits:	26,000
Move 10 digits from one zone to another:	88
Compare two 9-digit numbers:	97

INTERRUPTS: Information unavailable from Honeywell.

PHYSICAL SPECIFICATIONS: A 61/58 or 61/60 with card console, 100-lpm printer, 40-column-per-second card punch, and field engineering access requires an area 17 feet 3 inches by 11 feet 3 inches. The central processor/card console weighs 615 pounds and outputs 1515 BTU's per hour, the card punch (optional) weighs 264 pounds and outputs 380 BTU's per hour, and the printer weighs 550 pounds and outputs 1425 BTU's per hour. Power requirements are 120/208 ±10% VAC, 2.20 KVA, 60 Hertz. Ideal operating temperature is 73 degrees F. ±5 degrees, with a relative humidity of 40 to 60 percent noncondensing.

INPUT/OUTPUT CONTROL

I/O CHANNELS: Three overlapping internal I/O channels plus one disk subsystem channel per Model 61/58 or Model 61/60 central processor. Integrated controls are provided for a printer, card reader, card punch, disk subsystem, and alphanumeric and numeric keyboards. The maximum I/O rate is 312,000 bytes per second.

SIMULTANEOUS OPERATIONS: Processor operations can overlap I/O data transfer operations other than disk reading or writing.

CONFIGURATION RULES: The minimum configuration for a Model 61/58 Batch System consists of a central processor with 5120 bytes of memory, MSS1500 Mass Storage Subsystem with 3.456 million bytes, 100-lpm printer, and 100-cpm card reader and console with keyboards and display.

The minimum configuration for a Model 61/58 Multiworkstation System consists of a central processor with 10,240 bytes of memory, MSS1500 Mass Storage Subsystem with 5.76 million bytes, 100-lpm printer with 128 print positions, multiline asynchronous communications controller (CPF1512), and at least one terminal.

The minimum configuration for a Model 61/60 system consists of a central processor with 10,240 bytes of

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The following table summarizes the ratings given by these users. The number of responses to certain questions is lower than five due to nonapplicability of the questions to particular installations.

	Excellent	Good	Fair	Poor	WA*
Ease of operation	2	3	0	0	3.4
Reliability of mainframe	1	4	0	0	3.2
Reliability of peripherals	1	4	0	0	3.2
Maintenance service:					
Responsiveness	2	3	0	0	3.4
Effectiveness	3	2	0	0	3.6
Technical support	0	2	0	0	3.0
Manufacturer's software:					
Operating system	1	4	0	0	3.2
Compilers and assemblers	1	4	0	0	3.2
Application programs	0	1	0	0	3.0
Ease of programming	0	5	0	0	3.0
Ease of conversion	0	1	0	0	3.0
Overall satisfaction	1	4	0	0	3.2

*Weighted Average on a scale of 4.0 for Excellent.

The table clearly illustrates the uniformity of satisfaction expressed by these users. Yet the total picture was not quite so rosy as the responses to our standard questions seem to indicate. More than one user expressed doubt over just what Honeywell's marketing policies might be, and why there were so many changes in sales personnel. One user commented that he had dealt with three different salesmen in three years.

By far the highest praise went to Honeywell's field engineering force. Not one user had anything negative to say about maintenance. If the company could match this record in other areas, particularly marketing, dealing with Honeywell could be a honey of a transaction.□

PRU0110/PRU0210 PRINTERS: Available only for Model 60/58 systems, the PRU0110 has a minimum print speed of 100 lines per minute using either 96, or optionally 128, print positions. The PRU0210 Printer can achieve a print speed of 200 lines per minute; 128 print positions are standard.

PRU0301 PRINTER: Available for both Models 61/58 and 61/60, this drum printer features a character set of 63 characters and 132 print positions. The basic model has a rated print speed of 300 lines per minute when printing a subset of 49 contiguous characters, or 262 lines per minute when the full 63-character set is used. Optional features increase the nominal print speed to either 450 lines per minute (PRU0451) or 650 lines per minute (PRU0651) for the 49-character subset (or to 360 or 536 lines per minute, respectively, for the full 63-character set). Skipping speed is a maximum of 25 inches per second. The integral control unit includes a full-line buffer, enabling printing to proceed simultaneously with other printer operations. Printing is spaced at 10 characters per inch horizontally and 6 to 8 lines per inch vertically.

COMMUNICATIONS CONTROL

MODEL 61/58: Can be equipped with either a single-line controller for synchronous communications with other Honeywell or IBM computers, or a multiline controller for asynchronous communications with up to four terminals. Synchronous communications can use ASCII, EBCDIC, or ISO code and can transmit at up to 2000 or 9600 bits per second, depending upon the type of lines used (switched or leased, respectively). Asynchronous communications can accommodate any 8-bit code transparently, although ASCII code is normally used. ASCII code contains seven data bits plus one parity bit. Selectable transmission speeds are 110, 150, 200, or 300 bps for telegraphic lines and 110 to 2400 bps over phone lines, depending upon the type of terminals used (remotely or directly connected).

MODEL 61/60: Features a logically independent Front-End Processor (FEP) that can manage up to 16 asynchronous lines and one synchronous line. The FEP consists of: 1) a basic logic unit; 2) 8K, 12K, or 16K bytes of MOS memory with a 1.6-microsecond cycle time; 3) two 256-byte message buffers that link the FEP to the 61/60 central processor; 4) a Desk Unit that houses communications adapters and power circuits; 5) one or two 8-channel asynchronous multiline terminal adapters; 6) an 8-port I/O channel for connecting peripherals to the FEP; 7) a CRT display unit with 55-key typewriter keyboard, numeric keypad, and 960-character display screen; and 8) two tape cassette units for program loading and diagnostic functions. The CRT displays 12 lines of 80-characters. Each member of the 92-character ASCII set appears as a 5-by-7 dot matrix with a refresh rate of 60 Hz.

The basic multiline adapter allows up to eight remote or local terminals to be connected to the FEP. The terminals can operate asynchronously at up to three different transmission speeds ranging from 110 to 2400 bits per second. An optional synchronous line adapter enables the 61/60 to communicate with another computer at a speed of 600 to 4800 bits per second; the adapter provides parity checking and CRC error correction. With either adapter transmission is usually in ASCII code over either switched or leased lines. The FEP can handle a maximum total transmission rate of 15,000 bits per second.

Terminals that can be connected to the Model 61/60 include the Hazeltine 1000 and 2000 display terminals, the GE TermiNet 300, Teletype Model 33/35 KSR or ASR units, and other asynchronous TTY-compatible terminals.

SOFTWARE

OPERATING SYSTEM: One operating system is presently available for the Level 61 systems. Level 61 GCOS is a subset of Honeywell's General Comprehensive Operating Supervisor (GCOS). The subset of GCOS for the small-scale Level 61 computers can be generated in any of three ways—two for the Model 61/58 and one for the Model 61/60. On the Model 61/58, GCOS can provide either a monoprogramming environment (i.e., one program at a time) or simultaneous execution of one batch program plus up to four terminal programs, with the batch program having processing priority. On the 61/60, GCOS permits simultaneous execution of one batch program plus up to 16 terminal programs, with the conversational programs receiving processing priority.

Level 61 GCOS provides disk file management, program segmentation and swapping, recovery and restart facilities, and control of front-end communications processing in Model 61/60 systems.

Disk files are organized as follows. The basic unit of data transfer is one "page," consisting of two sectors or 576 bytes. Each disk file consists of a variable number of records and occupies a whole number of disk cylinders. Each record, in turn, is composed of a variable number of fixed-length elements, up to a maximum record length of one page (576 bytes). The "principal element" in each record contains an identifying key from one to 15 bytes in length. Any other elements in the record are called "secondary elements."

The structure of the disk files is "indexed random." Each file consists of the data records, written in random

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CONTRACT TERMS: Series 60 equipment is available for purchase or for rental under a 1-year, 3-year, or 5-year lease. The 1-year and 3-year basic monthly rentals entitle the user to 176 hours of 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. For scheduled usage beyond this period, with on-call maintenance service, the user pays an additional charge which is a fixed percentage of the monthly maintenance charge. Alternatively, the user can obtain on-call maintenance service at standard hourly rates of $45 per man-hour. Unlimited use is permitted for all peripheral devices and for central processors on a 5-year lease.■

EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	Rental (1-Year lease)*	Rental (5-Year lease)*
CENTRAL PROCESSORS AND OPTIONS					
CPS1580	61/58 processor; 5120 bytes	$20,060	$ 95	$418	$397
CMM1580	61/58 additional memory; 5120 bytes	7,010	40	146	139
CPS1610	61/60 processor; 10,240 bytes	25,380	135	611	580
MBS1640	16,384 bytes extended memory (EMS)	12,890	56	300	285
MBU1630	Additional 8K bytes extended memory	6,450	27	150	140
DCP1600	Front-end processor (FEP) unit including 8-channel asynchronous multiline adapter, 8K central processor with CRT, keyboards, and 2 cassette units	13,200	60	330	314
CPF1602	Desk and power unit for FEP	6,480	16	135	128
DCF1602	Additional 4K bytes of memory for FEP	1,600	8	51	39
DCF1633	Synchronous line adapter for FEP	2,160	5	49	47
DCA1621	Line Terminating Adapter (EIA RS-232C)	600	3	16	15
CPF1510	Single-line synchronous controller (SLC) for 61/58	8,640	34	194	184
CPF1511	Polling/selection option for SLC	2,880	11	65	62
CPF1512	Multiline asynchronous controller (MLC)	8,640	34	194	184
CPF1513	Additional channel addressing for MLC	880	3	24	23
CPF1514	Local channel adapter for MLC (current loop-back) interface	120	1	3	3
CPF1516	EIA adapter for MLC (RS-232C)	1,600	6	43	41
MASS STORAGE					
MSS1500	Mass storage subsystem (3,456 MB)	25,730	203	536	509
MSS1501	Additional 2.30 MB for MSS1500	5,800	24	145	128
MSS1502	Additional 5.76 MB for MSS1500	6,520	31	188	179
MSS1503	Additional 5.76 MB for MSS1500	13,500	96	300	285
MSC1300	Mass storage controller	7,490	36	164	156
MSA1303	Mass storage addressing for first two MSU0310 units	19,295	94	439	417
MSA1304	Mass storage addressing for third and fourth MSU0310 units	4,370	22	98	93
MSU0310	Mass storage unit (23MB)	13,040	59	368	350
CARD EQUIPMENT					
CPF1601	61/60 card console unit attachment	45	NC	1	1
CSU1581	Card console unit including 100-cpm card reader, 10-position digital display, numeric and alphanumeric keyboards	9,410	54	212	201
CSF1502	High-speed card reader attachment	575	2	13	12
CSF1503	200 cpm feature for CSU1581 (CSU1502 is prerequisite)	3,360	15	76	72
CSF1504	300 cpm feature for CSU1581 (CSU1502 and CSU1503 are prerequisites)	1,970	9	44	42
CSF1505	Mark read feature for CSU1581	2,880	15	64	63
PCU0040	40 cps card punch	4,030	28	106	101
CPU0041	Printing option for CPU0040	1,200	6	32	30
PRINTERS					
CPA1601	Standard printer addressing	2,830	5	64	61
PRU0110	100 lpm, 96 print positions	8,560	40	197	187
PRU0210	200 lpm, 128 print positions	14,450	66	356	338
PRF0111	32 additional print positions for PRU0110	1,760	10	42	40
CPA1602	Buffered printer addressing	5,090	9	114	108
PRU0301	300 lpm, 132 print positions	23,090	153	502	477
PRU0451	450 lpm, 132 print positions	29,760	187	675	642
PRU0651	650 lpm, 132 print positions	32,800	200	905	785

RETROFIT KITS		**One-Time Charge**
RK1558	From Model 58 to 61/58	$525
RK1559	From Model 58 to 61/60	985
RK1560	From Model 61/58 to 61/60	460

*Monthly rental includes maintenance charges.