# Honeywell Series 6000

## MANAGEMENT SUMMARY

The Series 6000, introduced on February 17, 1971, con-stitutes a strong Honeywell bid to maintain and extend the prominent position in the large-scale computer market that it obtained by acquiring the General Electric Com-pany's computer equipment business in 1970.

The Series 6000 is a logical successor to the third-generation GE-600 Series computer line (now called the Honeywell Series 600). The newer line is fully compatible with the GE-600 Series and uses most of the same peri-pheral equipment and software. Within this framework, Honeywell has made noteworthy hardware and software improvements, and—most significantly— has boosted the line's price/performance to a level that makes it fully competitive with the latest equipment from IBM and the other leading suppliers of medium-to-large-scale computer systems.

## BACKGROUND

To give prospective buyers a full understanding of what the Series 6000 is and how it got that way, a brief history of its predecessor, the GE-600, seems appropriate. Intro-duced in May 1964, immediately after the IBM System/360, the GE-600 Series computers were designed primar-ily as replacements for the IBM 7090 and 7094, the most widely used large-scale scientific computers of the second ▷

Impressive price/performance levels and an unusually effective operating system are the main attractions of Honeywell's new line of six medium-to-large-scale computers. The Series 6000 is fully compatible with the earlier GE-600 Series, uses most of the same peripheral equipment and software, and is well suited for both business and scientific applications.

## CHARACTERISTICS

MANUFACTURER: Honeywell Information Systems, Inc., 200 Smith Street, Waltham, Massachusetts 02154.

MODELS: Series 6000, Models 6030, 6040, 6050, 6060, 6070, and 6080.

### DATA FORMATS

BASIC UNIT: 36-bit word (plus parity bit).

FIXED-POINT OPERANDS: One word (36 bits), two words (72 bits), or one half-word (18 bits). In addition, partial words of 6 or 9 bits can be transferred into and out of the arithmetic and control registers. Models 6040, 6060, and 6080 also include facilities for performing decimal arithmetic and a variety of other operations on variable-length character strings.

FLOATING-POINT OPERANDS: One word, consisting of 27-bit-plus-sign fraction and 8-bit exponent; or two ▶
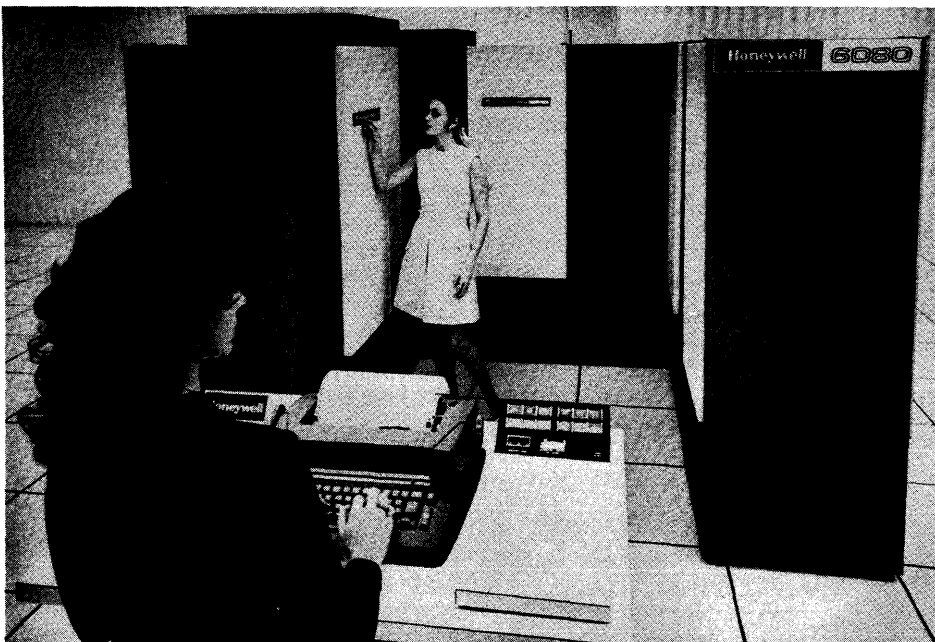


*Model 6080 is the most powerful of the six processor models in the Honeywell Series 6000. The Master Console is in the foreground.*

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generation. The line originally consisted of the GE-625 and GE-635, which were largely identical except for their core cycle times: 2 microseconds per 2-word access for the 625 and 1 microsecond for the 635. Both models offered up to 262K 36-bit words of core storage in multiple independent modules, with input/output operations controlled by independent I/O controllers. GE placed a strong emphasis on efficient multiprogramming and data communications under an integrated operating system called GECOS.

In 1968 GE introduced the GE-615, a lower-priced version of the GE-625 with the same 2-microsecond storage and slightly lower execution speeds. Then, in December 1969, GE unveiled the faster, integrated-circuit GE-655, which offered full upward compatibility plus up to 262K words of four-way-interleaved core storage with a 500-nanosecond cycle time.

Meanwhile, the GE-600 Series software and peripheral equipment, which had been plagued by far more than the normal rash of development problems, were being steadily improved in both reliability and performance. GECOS III, introduced in November 1967, became one of the few third-generation operating systems that really delivered the promised benefits of efficient performance in complex, "multi-dimensional" operating environments. As a result, more GE-600 Series orders were booked during 1969 than during the first four years after the line's introduction.

Thus, by the beginning of 1970, GE had finally developed a strong, proven large-scale computer line—only to see its performance outclassed by the IBM System/370 and other recently announced computer systems from companies such as Burroughs, RCA, and UNIVAC.

After acquiring the GE computer business, Honeywell assigned a high priority to the introduction of an improved large-scale computer family that would retain the GE-600 customer base and appeal to as many new buyers as possible. Honeywell naturally took full advantage of the GE development work that was in progress at the time of the acquisition. The result is the Series 6000, a strongly GE-flavored product line that blazes no new technological trails but exploits the current state of the art in a highly cost-effective manner.

## SYSTEM ARCHITECTURE

The Series 6000 consists of six central processors: Models 6030, 6040, 6050, 6060, 6070, and 6080. Their basic characteristics are summarized in the accompanying table. All electronics are of the integrated-circuit variety, and conventional magnetic cores are used for the main storage. All six models will be manufactured at the former GE plant in Phoenix.

words, consisting of 63-bit-plus-sign fraction and 8-bit exponent.

INSTRUCTIONS: Most instructions occupy one word and consist of an 18-bit address field, a 9-bit operation code, a 6-bit tag field that defines the address modification to be performed, a 1-bit interrupt inhibitor, and two unused 1-bit fields.

INTERNAL CODE: A 6-bit BCD code is standard and is used in all currently announced software, but the central processors are not code-sensitive and can conveniently manipulate data in any 6-bit or 9-bit code.

## MAIN STORAGE

STORAGE TYPE: Magnetic core.

CAPACITY: See table.

CYCLE TIME: See table. (interleaved accessing of the multi-module storage in Models 6050 through 6080 results in effective cycle times which are considerably faster than the indicated figures.)

CHECKING: Parity bit with each word is checked whenever storage is referenced.

STORAGE PROTECTION: The base address register indicates the base address and the number of 1024-word blocks assigned to the slave-mode program currently being executed. Any attempt to reference an address beyond these limits causes an interrupt.

## CENTRAL PROCESSORS

CONFIGURATION RULES: Model 6030 and 6040 systems have a single central processor. Model 6050, 6060, 6070, and 6080 systems can have a maximum of four central processors.

REGISTERS: The processor registers that are accessible to the program include: one 72-bit accumulator (A and Q registers), eight 18-bit index registers, one 18-bit base address register, one 18-bit indicator register, one 18-bit instruction counter, one 27-bit timer register, and one 8-bit exponent register.

INDEXING: Operand addresses can be modified by adding the contents of any of 15 registers, including the 8 index registers, the instruction counter, or the high-order or low-order 18 bits of the A or Q register. Indexing normally causes no increase in instruction execution times. The 8 index registers can also be used as additional 18-bit accumulators for half-precision operations.

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## CHARACTERISTICS OF THE SERIES 6000 PROCESSOR MODELS

| | Model 6030 | Model 6040 | Model 6050 | Model 6060 | Model 6070 | Model 6080 |
|---|---|---|---|---|---|---|
| **SYSTEM CONFIGURATION** | | | | | | |
| No. of Central Processors | 1 | 1 | 1 to 4 | 1 to 4 | 1 to 4 | 1 to 4 |
| No. of I/O Multiplexers | 1 | 1 | 1 to 4 | 1 to 4 | 1 to 4 | 1 to 4 |
| No. of System Controllers | 1 | 1 | 1 or 2 | 1 or 2 | 1 or 2 | 1 or 2 |
| **MAIN STORAGE** | | | | | | |
| Minimum capacity, 36-bit words | 65,536 | 65,536 | 98,304 | 98,304 | 131,072 | 131,072 |
| Maximum capacity, 36-bit words | 131,072 | 131,072 | 262,144 | 262,144 | 262,144 | 262,144 |
| Increment size, 36-bit words | 32,768 | 32,768 | 32,768 | 32,768 | 65,536 | 65,536 |
| Cycle time, microseconds | 1.2 | 1.2 | 1.2 | 1.2 | 0.5 | 0.5 |
| Words fetched per cycle | 2 | 2 | 2 | 2 | 2 | 2 |
| Storage interleaving | No | No | 2-way | 2-way | 2/4-way | 2/4-way |
| **CENTRAL PROCESSOR** | | | | | | |
| Extended (business) Instruction Set | No | Standard | No | Standard | No | Standard |
| Instruction overlap | No | No | Standard | Standard | Standard | Standard |
| Typical speed, instructions/second: | | | | | | |
| Single processor | 250,000 | 250,000 | 500,000 | 500,000 | 1,000,000 | 1,000,000 |
| Dual-processor system | NA | NA | 900,000 | 900,000 | 1,800,000 | 1,800,000 |
| **INPUT/OUTPUT CONTROL** | | | | | | |
| Channels per I/O Multiplexer | 8 to 16 | 8 to 16 | 8 to 24 | 8 to 24 | 8 to 24 | 8 to 24 |
| Maximum data rate per I/O Multiplexer, characters/second | 1,300,000 | 1,300,000 | 3,700,000 | 3,700,000 | 6,000,000 | 6,000,000 |
| **TYPICAL SYSTEM RENTAL** | $23,765 | $25,065 | $44,825 | $46,325 | $65,495 | $67,295 |

▷ Models 6030, 6050, and 6070 have essentially the same scientifically-oriented instruction repertoire and processing facilities as the GE-600 Series processors. They are well suited for scientific computation and for mixed business/scientific workloads. Deliveries of these three models are scheduled to begin in July 1971.

Models 6040, 6060, and 6080 have all the facilities of the other three models plus a new Extended Instruction Set (EIS). The EIS adds over 100 instructions oriented toward business data processing functions: decimal arithmetic, byte processing, editing, bit string manipulation, etc. Many of the individual EIS instructions accomplish functions that require numerous instructions in Models 6030, 6050, and 6070, as well as in most of the competitive computers. As a result, the EIS will yield significant reductions in both the execution times and memory requirements for most business-oriented programs. These performance improvements should make Models 6040, 6060, and 6080 well worth their modest additional cost over Models 6030, 6050, and 6070, respectively, for most installations with any significant volume of business data processing. First deliveries of the three business-oriented models are scheduled for March 1972.

In typical applications, Honeywell expects a Model 6040 system to deliver approximately 15 percent more through- ▷

▶ **INDIRECT ADDRESSING:** Possible to any desired number of levels, with full indexing capabilities at each level. Indexing can be performed either before or after the indirect word is obtained. An "indirect then tally" address modification capability facilitates character sequencing and progressing through tables in ascending or descending order.

**INSTRUCTION REPERTOIRE:** All models have a comprehensive set of about 185 single-address instructions for performing data movement, binary arithmetic, shifting, logic, and control operations on 36-bit single-precision, 72-bit double-precision, and 18-bit half-word operands. The basic instruction set also includes complete arithmetic facilities for single- and double-precision floating-point operands.

In addition, Models 6040, 6060, and 6080 include an Extended Instruction Set (EIS) containing over 100 additional instructions oriented toward efficient processing of character strings and bit strings. Included are edited moves, moves with code translation, and complete decimal arithmetic operations in both 2-address and 3-address formats.

**INSTRUCTION TIMES:** Representative execution times for the Series 6000 processors, in microseconds, are tabulated below. The times assume the use of interleaved storage in Models 6050 through 6080. Honeywell states ▶

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▷ put than a GE-635, while Model 6060 should deliver approximately twice the throughput of the GE-635. The Model 6070 central processor has essentially the same specifications and performance characteristics as the GE-655, while Model 6080 is essentially a GE-655 with the EIS facilities added for increased commercial processing power.

The Series 6000 systems employ a memory-oriented architecture. One or two System Controllers associated with the core storage modules regulate all communication between storage and the system's central processors, I/O Multiplexers, and communications processors. The I/O Multiplexer (IOM) is a hard-wired controller that coordinates all input/output operations over 8 to 24 independent data channels. The Series 6000 IOM's offer more flexibility and considerably higher throughput capacities than their GE-600 Series counterparts.

A Model 6030 or 6040 system is limited to a single central processor, one IOM, and up to 131K words of core storage. The four larger Series 6000 systems can include up to four central processors, four IOM's and 262K words (or 1.57 million 6-bit characters) of core storage. Neither extended core storage nor virtual memory is available for the line to date.

Although it lacks the automatic retry and error-correcting capabilities of the IBM System/370, the Series 6000 includes a number of hardware and software features that should enhance its reliability and minimize its down-time. Hardware maintenance features include programmable voltage and timing margins to convert intermittent failures into "solid" ones that can easily be located, history and fault registers to aid in diagnosing malfunctions, and the ability to simulate I/O operations without actually engaging the peripheral devices. The Total On-Line Testing System (TOLTS), an integral part of the GECOS 6000 operating system, performs on-line tests and diagnostics on any or all system components while normal processing continues. Moreover, the hardware modularity of Models 6050 through 6080 permits "fail-soft" configurations with two or more processors, I/O Multiplexers, and other critical components.

## PERIPHERALS AND COMMUNICATIONS

The Series 6000 offers most of the same peripheral equipment as the GE-600 Series. In addition, Honeywell has introduced a number of significant new devices:

- The DSS180 Disk Storage Subsystem is an effective Honeywell response to the IBM 2314/2319 subsystem, which the DSS180 outperforms in both speed of access and maximum storage capacity per subsystem. Average head positioning time is only 34 milliseconds for the DSS180, versus 60 milliseconds for the 2314/2319 drives. A DSS180 subsystem can ▷

▶ that interleaving (currently available only in systems with at least 131K words) results in a 15 to 20 percent speed improvement.

| Model: | 6030/ 6040 | 6050/ 6060 | 6070/ 6080 |
|---|---|---|---|
| Fixed-point add to register | 2.95 | 1.51 | 0.71 |
| Fixed-point add to storage | 4.29 | 3.29 | 1.78 |
| Multiply | 13.53 | 3.61 | 3.61 |
| Divide | 15.73 | 7.28 | 7.28 |
| Floating-point add | 6.83 | 1.95 | 1.73 |
| Floating-point subtract | 6.73 | 1.93 | 1.70 |
| Floating-point multiply | 11.82 | 3.15 | 3.12 |
| Floating-point divide | 26.34 | 7.48 | 7.48 |
| Load register | 2.95 | 1.51 | 0.71 |
| Store register | 2.68 | 1.70 | 0.95 |
| Compare register | 2.95 | 1.51 | 0.71 |
| Decimal add (5 digits)* | 10.55 | 5.93 | 4.53 |
| Decimal subtract (5 digits)* | 10.55 | 5.93 | 4.53 |
| Decimal multiply (5 digits)* | 13.95 | 9.38 | 7.98 |
| Decimal divide (5 digits)* | 18.55 | 13.98 | 12.58 |
| Alphanumeric move (5 chars)* | 11.97 | 7.34 | 5.66 |
| Alphanumeric compare (5 chars)* | 7.75 | 6.06 | 4.56 |
| Edited move (5 chars)* | 11.87 | 7.30 | 5.90 |

\* EIS instructions, in Models 6040, 6060, and 6080 only.

PROCESSOR MODES: There are two modes of processor operation: master and slave. The master mode, used only by GECOS 6000, allows unrestricted access to all of core storage, permits initiation of I/O operations, and permits setting of control registers. The slave mode is used by all user programs and also by GECOS 6000 when appropriate. In the slave mode, all storage references are relative to the base address register's contents and are restricted to assigned boundaries; program execution times are limited by the timer register; and input/output and certain control operations cannot be executed.

INTERRUPTS: Interrupt signals are generated by conditions such as successful completion of I/O operations, I/O errors, arithmetic overflow, timer runout, attempts to reference out-of-bounds storage locations, etc. Every interrupt results in the setting of a specific interrupt cell in the System Controller. This causes the processor to take its next instruction from a predetermined storage location, which normally results in storage of the processor's status and a transfer to the appropriate interrupt servicing routine. In multiprocessor systems, a single "control" processor, determined by a manual switch setting, services all interrupts.

CONSOLE: The Series 6000 Master Console is a freestanding unit that provides direct communication between the operator and GECOS 6000. It permits data entry via the standard typewriter keyboard and prints computer-generated messages at 15 characters/second. A small display panel keeps the operator informed of the system's operating status. The console connects to a data channel on an I/O Multiplexer and is controlled like a peripheral subsystem. An optional Auxiliary Console, similar to the Master Console except for a different display panel, can be used to print specific types of operator messages.

## INPUT/OUTPUT CONTROL

CONFIGURATION RULES: Model 6030 and 6040 systems have one Input/Output Multiplexer (IOM), while Model 6050, 6060, 6070, and 6080 systems can include from one to four IOM's. The IOM is a microprogrammed ▶

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include form 3 to 18 on-line disk drives holding from 83 to 497 million 6-bit characters, versus a maximum of 8 on-line drives holding 233 million bytes in the 2314/2319 subsystem.

● The DSS190 is a fast-access, high-capacity disk storage system whose specifications closely parallel those of the IBM 3330—except that Honeywell again offers more than twice the on-line storage capacity per subsystem. A DSS190 subsystem can include up to 16 disk drives and store up to 2.13 billion 6-bit characters, versus a maximum of 8 drives and 800 million bytes for the 3330.

● The MTH502 and MTH505 Magnetic Tape Units read and write on 9-track tape at either 800 or 1600 bits per inch, at data transfer rates ranging from 80,000 to 266,000 characters per second. They offer most of the features of the new IBM 3420 tape drives while delivering significantly more performance per dollar than the earlier GE-600 Series tape drives. As a result, nearly all Series 6000 systems will probably utilize the MTH502 or MTH505 drives.

● The PRT300 Printer uses interchangeable horizontal-train cartridges, similar to those of the IBM 1403 Model N1, to produce high-quality printing at up to 1150 lines per minute with the standard 48-character set.

● The 765, 775, and 785 Visual Information Projection (VIP) systems are new CRT display systems that can be used with the Honeywell Series 200, 400, and 600 computers as well as with the Series 6000. Based on the widely used GE DATANET-760 terminals, they feature larger screens, faster response times, and larger display capacities than previous Honeywell CRT equipment. All three models have a 14-inch (diagonal) screen and a full alphanumeric keyboard. Types 765 and 775 display up to 1012 characters of data in 22 lines of 46 characters each, while Type 785 displays up to 2024 characters in 22 lines of 92 characters each. Type 765 transmits asynchronously at 120 characters per second (1200 bps), while Types 775 and 785 transmit synchronously at 250 or 300 characters per second (2000 or 2400 bps).

For data communications control functions, the Series 6000 buyer can choose either of two front-end communications processors: the DATANET 305 or 355. The DATANET 355, introduced with the GE-655, is a stored-program processor capable of handling large communications loads. The new DATANET 305 is a comparatively low-cost processor that will supersede the long-lived DATANET-30 in installations where the communications traffic is lighter; a DATANET 305 can handle a maximum of 12 low-speed and/or 2 voice-grade lines.

controller that coordinates all data transfer operations between peripheral subsystems and core storage. Each IOM in a Model 6030 and 6040 system has 8 data channels, expandable to a maximum of 16. Each IOM in a Model 6050, 6060, 6070, or 6080 system has 8 data channels, expandable to a maximum of 24.

Each data channel normally accommodates one peripheral device or subsystem. Dual-channel control units, which permit simultaneous read/write operations, are available for all tape and most disk subsystems.

The minimum Series 6000 system configuration includes one central processor, one IOM, one console, one card reader, one card punch, one printer, one magnetic tape control and four drives, and 30 million characters of mass storage (any type).

SIMULTANEOUS OPERATIONS: One input or output operation on each data channel can occur simultaneously with computation in each processor. All installed processors and IOM's can operate simultaneously and independently, with interference occurring only when two or more of those units simultaneously attempt to access the same 65K-word core storage module.

MAXIMUM I/O DATA RATES: The maximum aggregate data rate that can be handled by each IOM is 1,300,000 characters/second in Models 6030 and 6040, 3,700,000 characters/second in Models 6050 and 6060, and 6,000,000 characters/second in Models 6070 and 6080. Each standard data channel is rated at 650,000 characters/second. When a peripheral subsystem with a higher data rate is connected, Honeywell supplies a special Peripheral System Interface at no extra charge; this results in a corresponding increase in the total throughput capacity of the IOM.

### MASS STORAGE

DSS167 REMOVABLE DISK STORAGE SUBSYSTEM: Provides medium-capacity random-access storage in interchangeable 11-disk packs which are physically compatible with the IBM 2316 Disk Pack. The subsystem consists of a controller and either six or nine disk pack drives; in the nine-drive configuration, eight drives are on-line and one serves as a spare. Each disk pack stores 15,360,000 six-bit characters. There are 200 data tracks on each of the 20 recording surfaces, and each track is divided into 10 sectors of 384 characters (64 words) each. Up to 76,800 characters (20 tracks) can be read or written at each position of the comb-type access mechanism. Average head movement time is 75 milliseconds, average rotational delay is 12.5 milliseconds, and data transfer rate is 208,000 six-bit characters/second. A second, nonsimultaneous data channel permits two computers to share the same DSS167 subsystem.

DSS170 REMOVABLE DISK STORAGE SUBSYSTEM: Provides large-capacity random-access storage in interchangeable 11-disk packs which are physically compatible with the IBM 2316 Disk Pack. The subsytem has a fixed configuration consisting of a controller and nine disk pack drives, any eight of which may be on-line at a time. Each disk pack stores 27,648,000 six-bit characters; total on-line capacity of the subsystem is 221,184,000 characters. There are 200 data tracks on each of 20 recording surfaces, and each track is divided into 18 sectors of 384 characters (64 words) each. Up to 138,240 characters (20 tracks) can be read or written at each position of the ▶

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### ▷ SOFTWARE AND COMPATIBILITY

All of the Series 6000 software revolves around GECOS 6000, the successor to GECOS III. GE's persistence in debugging and improving the GECOS software eventually resulted in one of the very few third-generation operating systems whose overall performance has satisfied a high proportion of its users. This proven software support is unquestionably one of the biggest advantages the Series 6000 offers to prospective users.

GECOS is designed to provide a "multi-dimensional" user environment in which local batch jobs, remotely entered batch jobs, on-line transaction processing, and time-sharing can be processed concurrently. Moreover, programs of all these types can access a single common data base. The GE-developed Integrated Data Store (I-D-S) system is a particularly useful tool for creating and managing a multi-function data base.

In addition to the existing GE-600 Series software, Honeywell is making a number of significant new software facilities available for the Series 6000. These include a full ANS COBOL compiler, a fast FORTRAN compiler that combines the facilities of the batch and time-sharing FORTRAN compilers for the GE-600 Series, and several extensions of the GECOS operating system.

Honeywell promises full upward compatibility between the GE-600 Series and the Series 6000, so present GE-600 users should be able to move up to the new line with little or no difficulty. But there is no direct program compatibility between the 6000 Series and any other Honeywell or competitive computer line.

A Conversion Aids Programming System (CAPS) will aid users of the small-to-medium-scale GE-400 Series computers in converting their COBOL and assembly-language programs for operation on the Series 6000. But for users of the Honeywell Series 200, the IBM System/360, or other competitive equipment, Honeywell currently offers no special hardware or software facilities to ease the task of converting to a Series 6000 system. Even so, Honeywell's ANS COBOL and FORTRAN compilers, together with other software aids such as the Indexed-Sequential Processor, will make conversion to the Series 6000 a fairly straightforward task for most COBOL- and FORTRAN-oriented installations.

### COMPETITIVE POSITION

System rentals for practical Series 6000 configurations span a wide range, from about $20,000 to well over $100,000 per month. Thus, the Series 6000 will be competing against such impressive performers as the IBM System/370 Models 145, 155, and 165, the Burroughs B 6700, the NCR Century 300, the RCA 6 and 7, and the UNIVAC 1106, 1108, and 1110. ▷

comb-type access mechanism. Average head movement time is 75 milliseconds, average rotational delay is 12.5 milliseconds, and data transfer rate is 416,000 six-bit characters/second.

DSS180 REMOVABLE DISK STORAGE SUBSYSTEM: Provides fairly rapid random access to large quantities of data stored in 11-disk packs which are physically compatible with the IBM 2316 Disk Pack. The basic subsystem consists of a controller, disk file electronics, and three disk pack drives. Up to 6 more drives can be added to the basic subsystem, and the additional disk file electronics unit permits a total of up to 18 drives to be connected. Each disk pack stores 27,648,000 six-bit characters, so the total on-line capacity of a DSS180 subsystem can range from 83 million to 497 million characters. Data formats are identical with those of the DSS170 subsystem, described above. Average head movement time is 34 milliseconds, average rotational delay is 12.5 milliseconds, and data transfer rate is 416,000 six-bit characters/second. A second data channel of either the simultaneous or nonsimultaneous (switched) type is optional. DSS180 deliveries are scheduled to begin in May 1971.

DSS190 REMOVABLE DISK STORAGE SUBSYSTEM: Provides fairly rapid random access to extremely large quantities of data stored in interchangeable 12-disk Honeywell M4050 Disk Packs. The basic subsystem consists of a controller and 2 disk pack drives and is expandable, in single-drive units, to a maximum of 16 drives. Each disk pack stores 133 million 6-bit characters, so the total on-line capacity of a DSS190 subsystem can range from 266 million to 2.13 billion characters. There are 404 data tracks on each of the 19 recording surfaces, and each track is divided into a maximum of 45 sectors of 384 characters (64 words) each. Up to 328,320 characters (19 tracks) can be read or written at each position of the comb-type access mechanism. Average head movement time is 30 milliseconds, average rotational delay is 8.3 milliseconds, and data transfer rate is 1,074,000 six-bit characters/second.

The DSS190 subsystem employs multiple logical channels, command stacking, seek overlap, and sector search facilities for improved throughput. Error detection, automatic retry, and error correction features help to ensure data integrity. A second data channel of either the simultaneous or nonsimultaneous (switched) type is optional. Customer deliveries of the DSS190 are scheduled to begin in the third quarter of 1972.

DSS270 DISK STORAGE SUBSYSTEM: Proves fast random access to moderately large quantities of data stored on nonremovable disks. Employs the highly reliable Burroughs fixed-head-per-track disk units. Each DSU270 Disk File Unit stores 15.3 million 6-bit characters in 40,000 sectors of 384 characters (64 words) each. Average access time is 26 milliseconds, and data tranfer rate is 333,000 characters/second. The DSC270 Disk Storage Controller accommodates from 1 to 4 DFE270 Electronics Units, and each DFE270 controls up to 5 DSU270 File Units. Thus, a DSS270 subsystem can store up to 307 million characters. An optional second data channel permits simultaneous read/write access to two file units connected to two different DFE270 units.

### INPUT/OUTPUT UNITS

MAGNETIC TAPE UNITS: Honeywell offers a wide range of tape drives for the Series 6000. All models read and record on standard 1/2-inch tape in IBM-compatible ▶

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▷ In performance, the Honeywell Models 6040 and 6060 are closely comparable with the System/370 Models 145 and 155, respectively, and the Honeywell systems offer modest price advantages. The Model 6080 ranks considerably lower in both price and performance than the System/370 Model 165, though Honeywell expects a dual-processor Model 6080 system to outperform the Model 165.

In similar model-to-model comparisons with the other systems mentioned above, the Series 6000 computers turn out to be fully competitive in both price and performance. They lack the impressive technological innovations of the IBM System/370 and some other recently announced equipment. But for many installations this possible drawback will be outweighed by the Series 6000's proven, efficient software and Honeywell's fully bundled support policy. After all, what really counts is still the total cost of getting the job done—and on this basis, many prospective users will find the Series 6000 hard to beat. □

▶ formats. Their data formats, tape speeds, recording densities, and data transfer rates (expressed in 6-bit characters per second) can be summarized as follows:

MTH200: 7 tracks, 37.5 ips, 200/556 bpi, 7,500/21,000 char/sec.

MTH300: 7 tracks, 37.5 ips, 200/556/800 bpi, 7,500/21,000/30,000 char/sec.

MTH201: 7 tracks, 75 ips, 200/556 bpi, 15,000/42,000 char/sec.

MTH301: 7 tracks, 75 ips, 200/556/800 bpi, 15,000/42,000/60,000 char/sec.

MTH372: 7 tracks, 150 ips, 200/556, 30,000/83,000 char/sec.

MTH373: 7 tracks, 150 ips, 200/556/800 bpi, 30,000/83,000/120,000 char/sec.

MTH402: 9 tracks, 37.5 ips, 200/556 bpi, 10,000/28,000 char/sec.

MTH403: 9 tracks, 37.5 ips, 200/556/800 bpi, 10,000/28,000/40,000 char/sec.

MTH404: 9 tracks, 75 ips, 200/556 bpi, 20,000/56,000 char/sec.

MTH405: 9 tracks, 75 ips, 200/556/800 bpi, 20,000/56,000/80,000 char/sec.

MTH492: 9 tracks, 150 ips, 200/556 bpi, 40,000/111,000 char/sec.

MTH493: 9 tracks, 150 ips, 200/556/800 bpi, 40,000/111,000/160,000 char/sec.

MTH502: 9 tracks, 75 ips, 800/1600 bpi, 80,000/160,000 char/sec.

MTH505: 9 tracks, 125 ips, 800/1600 bpi, 133,000/266,000 char/sec.

All models use a single-capstan drive mechanism in which the tape's oxide surface touches only the read/write head. Both single-channel and dual-channel tape controllers are available. Each single-channel controller handles up to 8 tape drives, while each dual-channel controller handles up to 16 tape drives and permits simultaneous read/write operations on any 2 drives.

The MTH502 and MTH505 Magnetic Tape Units, announced along with the Series 6000, include a number of new features: phase-encoded recording at 1600 bpi, automatic threading, power windows, precision tape cleaners, and a radial subsystem configuration that facilitates maintenance. Deliveries of the MTH502 and MTH505 are scheduled to begin in the second quarter of 1972; all other models are currently in production.

CRZ201 CARD READER: Reads 80-column cards serially by column at 900 cpm, or 51-column cards at 1200 cpm. The input hopper and normal output stacker hold 2000 cards each, and a program-selectable auxiliary stacker holds 1000 cards. Hollerith and binary cards can be read in intermixed fashion. Cards are read at two independent read stations, and the results are compared automatically. A character validity check is also performed on Hollerith cards.

CPZ201 CARD PUNCH: Punches 80-column cards in Hollerith or binary code at 300 cpm, with read-after-punch checking. Has a 1200-card input hopper, a 1200-card main stacker, and a 100-card reject stacker.

PRT201 PRINTER: Prints at 1200 lpm using 46 contiguous characters on the rotating print drum, and at 938 lpm when all 64 characters are used. Has 136 print positions. Skipping speed is 27.5 inches/second. Handles continuous forms from 3 to 19 inches in width. Prints 6 or 8 lines per inch, with vertical format controlled by a paper tape loop and by control characters in the data.

PRT300 PRINTER: Features a horizontal-train print mechanism utilizing interchangeable train cartridges. Various character sets containing from 16 to 63 printable characters are available. Prints at 1150 lpm using a 48-character set or 1052 lpm using a 63-character set. Burst rates of up to 2500 lpm are possible for all-numeric printing. Has 136 print positions. Skipping speed is up to 70 inches/second. Handles continuous forms from 3 to 21 inches in width. Prints 6 or 8 lines per inch, with vertical format controlled by a paper tape loop and by control characters in the data.

PSC200 PERIPHERAL SWITCH: Permits manual switching of a peripheral system from one I/O Multiplexer to another. Can also be used to select either of two peripheral devices or subsystems connected to a single I/O channel. The basic PSC200 is a free-standing console containing one peripheral switch. Up to 15 additional switches can be added if desired.

### COMMUNICATIONS CONTROL

DATANET 355: An independently programmed computer designed to relieve the Series 6000 central processors of data communications control functions. Handles simultaneous communications with approximately 200 teletypewriters at 110 bps, or 32 remote batch terminals at 2400 bps, or 16 broad-band lines at 40,800 bps, or with various mixes of the three classes. Controls all interaction with remote terminals, including line control, message buffering, and code conversion. Includes either 16,384 or 32,768 18-bit words of core ▶

## Honeywell Series 6000

storage with a 1-microsecond cycle time. Has a repertoire of 96 single-address instructions. Operates in binary mode on data fields of 6, 9, 18, or 36 bits. Has 16 priority interrupt levels, each with 16 sublevels.

The DATANET 355 bypasses the Series 6000 I/O Multiplexers and connects directly to one or more System Controllers via an ICA355 Intercomputer Adapter with up to four ports. A maximum of two DATANET 355's can be used in a Series 6000 system. Card, printer, disk, and tape I/O units may be connected directly to the DATANET 355 if desired.

A DATANET 355 can be equipped with up to two HLA355 High-Speed Line Adapters and up to six LLA355 Low-Speed Line Adapters. The HLA355 is a communications controller with up to 16 concurrently operating subchannels. Each HLA355 subchannel can handle either full-duplex or half-duplex transmission, in either synchronous or asynchronous mode, at speeds ranging from 75 to 50,000 bits per second. The LLA355 is a time-division multiplexer for low-speed terminals that transmit asynchronously in either full-duplex or half-duplex mode. Each LLA355 can be equipped with up to 52 independent subchannels and can handle up to 52 terminals operating at 110 bps or below, or 26 terminals operating at up to 150 bps, or 17 terminals operating at up to 300 bps.

Terminals supported by the DATANET 355 and the associated software include the G-100 Series computers, the 765/775/785 VIP display terminals, the TermiNet 300 teletypewriter, the Teletype Models 33, 35, and 37, and the IBM 2741 Communications Terminal. DATANET 355 deliveries are scheduled to begin in July 1971.

DATANET 305: A microprogrammed processor designed to handle basic communications control functions (line control, message buffering, code conversion, etc.) in smaller Series 6000 systems. Handles a maximum of 12 low-speed and/or 2 medium-speed lines. The low-speed lines support Teletype Models 33, 35, and 37 or TermiNet 300 terminals operating at 10, 15, or 30 characters per second, while the medium-speed lines support G-100 Series computers operating as remote batch terminals at 2000 or 2400 bps. The DATANET 305 interfaces with the Series 6000 computers via a data channel on an Input/Output Multiplexer. Its functional specifications are very similar to those of the venerable DATANET-30. Deliveries are scheduled to begin in March 1972; until then, the DATANET-30 will be supplied on an interim basis.

### SOFTWARE

GECOS 6000: This integrated operating system is the basis for all of the Series 6000 software. Usable on all Series 6000 hardware configurations, it controls concurrent local batch processing, remote batch processing, on-line transaction processing, and time-sharing. GECOS 6000 is an improved version of the GECOS III operating system that has been peforming effectively in GE-600 Series installations for more than two years.

GECOS 6000 handles local and remote batch jobs in the same manner except for the input and output routines they use. User jobs can enter the system simultaneously from multiple local and remote peripherals. A System Scheduler can be used to classify, validate, and schedule a number of incoming job streams. Users can assign priorities to their jobs—including an option to defer processing

until a later time. Each incoming job is placed in the job queue in accordance with its relative priority; for jobs without pre-assigned priorities, GECOS calculates priorities on the basis of their resource requirements.

The allocation phase of GECOS 6000 assigns peripheral equipment and core storage to each activity of a job in accordance with its priority and resource requirements. Storage is allocated in 1024-word blocks. All blocks allocated to an activity must be contiguous, and GECOS performs storage compaction operations when necessary to ensure effective storage utilization. Lower-priority jobs are "swapped" out of core storage when necessary to make room for high-priority activities. When the required storage has been allocated to it, each activity is placed in the dispatcher queue, a dynamic list of all the activities in core which are ready for execution.

All activities are executed under the supervision of the GECOS 6000 dispatcher. The dispatcher attempts to keep as many system components as possible in simultaneous use by continually transferring control to the highest-priority activity that can effectively utilize the processor and/or peripheral subsystems. All input/output operations are performed under the control of the GECOS File and Record Control routines, which provide the usual facilities for logical record processing and error handling.

The execution of an activity or job may terminate either normally or abnormally under GECOS 6000. Upon normal termination, GECOS writes an accounting record on the System Output File, itemizing the system resources used by the activity. Successive compilations of the same type are automatically run as a single activity to avoid repetitive de-allocation and re-allocation of the same system resources. Abnormal termination occurs when an activity tries to execute an illegal operation; it can be accompanied by a memory dump and/or by special abort actions specified by the programmer.

GECOS 6000 includes an output collection mechanism and an output disbursing function. The output files generated by all activities are collected within the GECOS file system and then batched on multiple printers and/or card punches. Printing and punching are performed concurrently with the processing of other jobs and entry of still other jobs into the system. GECOS can handle a maximum of 63 concurrent jobs.

GECOS 6000 is designed for use in both single-processor and multiprocessor configurations. In multiprocessor systems, the dispatcher collects activities for all processors from a single queue. All processors can execute both GECOS and user programs, but only the one designated to be the control processor responds to interrupts.

Remote access is a featured capability of GECOS 6000 in each of its processing dimensions: batch, transaction, and time-sharing. The communications control functions are performed by one or two DATANET 305 or 355 Communications Processors. Any Series 6000 program that can be entered at the central computer site can also be entered remotely via either a G-100 Series batch terminal or a keyboard terminal. A Communications Mass Store Link permits remote batch terminals to communcate directly with mass storage via a DATANET 355, bypassing the central processor and main storage. A Transaction Processor Monitor causes the submission of transactions from remote terminals to trigger the loading execution of the appropriate application programs.

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▶ TIME-SHARING: The GECOS 6000 Time-Sharing System, in connection with a DATANET 305 or 355 Communications Processor, provides time-sharing computing service 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 single slave activity under GECOS, suballocates storage and subdispatches the processor to the programs of individual time-sharing users. It also performs various services for the time-sharing programs, including I/O control, file creation, cataloging, storage protection, and resource accounting.

GECOS 6000 Time-Sharing users have a choice of five programming languages: Extended BASIC, FORTRAN, ABACUS (which causes the time-sharing terminal to function as a desk calculator), Data Query (which performs selective data retrieval from an I-D-S-structured data base), and dataBasic (which combines content-addressable data management capabilities with BASIC-like procedural statements). A Text Editor permits terminal users to create a body of text, edit it, save it, retrieve it, and print it in a specified format.

A time-sharing batch mode enables terminal users to create jobs, enter them in the batch job stream for processing, check their status, and receive all or part of the resulting output at their terminals. Also available to time-sharing users are a conversational debugging facility, a file inspection and maintenance facility, a conversational file management subsystem, media conversion routines, and a large library of application programs. The Time-Sharing System has an open-ended design that enables users to add commands or subsystems, or to replace the standard time-sharing executive with one of their own design.

FILE SYSTEM: The GECOS 6000 File System provides powerful file management capabilities, including multilevel user catalogs, file sharing, and access control. The system employs a hierarchical, "tree-structured" design. A System Master Catalog lists the various User Master Catalogs, and each user may in turn define one or more levels of subcatalogs. Users may permit general sharing of their files or specify individual users who may 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. From the programmer's viewpoint, all file processing is performed at the logical level, with GECOS handling all physical I/O operations. If desired, users can request that their files be stored on specific types of devices. The File System will accommodate files organized under the I-D-S concept, described below.

INTEGRATED DATA STORE: I-D-S is a GE-developed technique for describing, creating, and managing a data base. It provides a convenient method for describing and processing complex information structures through meaningful association of the contents of the data records. This record association is achieved through the use of chains, which provide cross-reference linkages between the records. A chain contains all the information about a particular function (e.g., all the purchase order records for a specific order). Each chain contains one master record and any number of detail records. A single record may be a member of numerous chains, and a master record in one chain can be a detail record in another. A data base organized in this manner can be conveniently interrogated by all functions of the business, with each individual data item stored only once and linked to all the logically related items.

I-D-S uses a set of COBOL-like statements to describe, create, and process a data base. The I-D-S language is processor- and device-independent. It permits a single data base to reside in a mixture of random-access storage devices. I-D-S provides file protection for concurrent users of the same data base and automatically maintains a journal that provides an audit trail. A set of related utility routines facilitates initialization, loading, and unloading of the data base as well as recovery and restarting.

An I-D-S data base can be accessed from remote terminals by means of the Data Query System. Users can retrieve specific information without concerning themselves with the characteristics of the file structures. The Data Query System receives and analyzes inquiries from terminals, retrieves the requested information, and transmits the resulting output to the requesting terminal, a central-site printer, and/or a permanent file.

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 may be placed on a faster random-access device to speed up the access process. ISP records are blocked into 320-word pages, and the data records within a page can be up to 256 words in length. The key field can be located anywhere in the data record and is unrestricted in length. ISP should facilitate the conversion of indexed-sequential programs written for other computer systems by making it unnecessary to redesign the associated files or data bases.

TOTAL ON-LINE TESTING: TOLT is an on-line test and diagnostic system that runs under GECOS 6000. Its objective is to improve the system's reliability and availability through the use of on-line preventative and corrective maintenance techniques. TOLT monitors and saves all error status information, makes periodic surveillance checks of various hardware modules, and calls in specific diagnostic tests and on-line troubleshooting programs. TOLT and GECOS 6000 are designed to take full advantage of the various maintenance facilities of the Series 6000 hardware: programmable voltage margins, programmable timing strobes, history registers, programmamble channel wraparounds, parity and sequence checks, snapshot channel hardware, and a fault register.

COBOL: The Series 6000 COBOL compiler is a new implementation of the full American National Standard (ANS) COBOL language. It provides the maximum level of each of the functional modules of ANS COBOL, including the Sort, Report Writer, and Segmentation facilities, as well as certain extended capabilities. The com piler operates under GECOS 6000 in a full multiprogramming environment. Scheduled for delivery in June 1971, it will supersede the earlier GE-600 Series COBOL compiler (which implemented most of the COBOL-65 language but lacked the Table Handling and Random Access facilities).

FORTRAN: The Series 6000 FORTRAN compiler is designed for operation under GECOS 6000 in local batch, remote batch, or time-sharing mode. It combines the features of the earlier GE-600 Batch and Time-Sharing FORTRAN compilers. The language is FORTRAN IV, consisting of the full American National Standard FORTRAN language plus numerous useful extensions. Among the extensions are arrays of up to seven dimen- ▶

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► sions, nonstandard returns from subroutines, multiple entry points, ENCODE and DECODE (for memory-to-memory conversions), generalized expressions, octal format conversion, NAMELIST, a PARAMETER statement, and an extended TYPE statement. The compiler offers a variety of input and output options and promises exceptionally fast compilation—up to 20,000 statements per minute. Delivery is scheduled for June 1971, and global optimization capabilities will be added in September 1971.

ALGOL: The Series 6000 ALGOL compiler operates under GECOS 6000 and permits programs to be compiled and executed in local batch, remote batch, or time-sharing mode. It encompasses the ALGOL-60 language, including recursive processing and dynamic storage allocation. Useful extensions include extended-precision real (floating-point) numbers, an extended integer division operator, debugging aids, segmentation facilities, character-handling capabilities, and a set of input/output functions for both physical and logical records.

BASIC: Series 6000 Extended BASIC is a fast, one-pass, conversational compiler that operates under the GECOS 6000 Time-Sharing System. It implements an improved version of the easy-to-learn BASIC language. Language facilities include built-in mathematical functions, a matrix package, a string manipulator, BCD file input/output, subroutine CALL, formatted printing, and chaining.

GENERAL MACRO ASSEMBLY PROGRAM: GMAP is a two-pass assembler that translates programs from symbolic assembly language into absolute or relocatable binary machine language. The symbolic instructions permit full utilization of the Series 6000 hardware fiacilities, and a large complement of pseudo-instructions provides control of location counters, symbol definition, data generation, program linkages, conditional assembly, and the assembler output. GMAP also provides facilities for defining, cataloging, and calling user-defined macros. Series 6000 GMAP operaties under GECOS 6000 and is upward-compatible with GE-600 Series GMAP under GECOS III.

UTILITY PROGRAMS: Routines available for the Series 6000 include a Sort/Merge program that can utilize any combination of mass storage or magnetic tape units, a Bulk Media Conversion (BMC) program designed to handle high-volume input or output transcription functions, a System Editor that generates and maintains various types of library files, a Utility program for copying, comparing, positioning, and printing tape or mass storage files, and a Conversion Aids Programming System (CAPS) that assists in the conversion of COBOL or assembly-language programs written for the GE-400 Series computers.

APPLICATION PROGRAMS: The Series 6000 application programs currently available from Honeywell include:

    Automatically Programmed Tools (APT)
    Biomedical Statistical Programs (BMD)
    Civil Engineering Package
    Electric Utility Engineering Programs
    Generalized Inventory Management System (GEIMS)
    Generalized Parts Explosion System (GEPEXS)
    Linear Programming System
    MATHPAC (mathematical/engineering subroutines)
    PERT/Cost
    PERT/Time
    SIMSCRIPT (simulation language)
    Time-Series Forecasting Program (GECAST)

Also available to Series 6000 users is an extensive library of time-sharing programs in the following categories: engineering, business and finance, geometric and plotting, optimization and networks, mathematics, curve fitting and regression, statistical, demonstration, educational and tutorial, and utility and information.

## PRICING

EQUIPMENT: The following configurations are typical of the Series 6000 systems that are expected to be widely installed. All are fully supported by the GECOS 6000 software. All necesssry control units and features are included in the indicated prices, and the quoted prices include equipment maintenance.

TYPICAL MODEL 6030 SYSTEM: Consists of Model 6030 Central Processor, 98K words of core storage, I/O Multiplexer with 8 channels, console, DSS180 Disk Storage Subsystem with 6 drives (166 million characters), six MTH502 Magnetic Tape Units (80/160KC) and single-channel control, PRT300 Train Printer, CRZ201 Card Reader, and CPZ201 Card Punch. Monthly rental price is $23,765.

TYPICAL MODEL 6040 SYSTEM: Same as above, with Model 6040 Central Processor in place of Model 6030. Monthly rental price is $25,065.

TYPICAL MODEL 6050 SYSTEM: Consists of Model 6050 Central Processor, 196K words of core storage, I/O Multiplexer with 9 channels, console, DSS190 Disk Storage Subsystem with 4 drives (533 million characters), twelve MTH505 Magnetic Tape Units (133/266KC) and dual-channel control, two PRT300 Train Printers, two CRZ201 Card Readers, and CPZ201 Card Punch. Monthly rental price is $44,825.

TYPICAL MODEL 6060 SYSTEM: Same as above, with Model 6060 Central Processor in place of Model 6050. Monthly rental price is $46,325.

TYPICAL MODEL 6070 SYSTEM: Consists of Model 6070 Central Processor, 196K words of core storage, I/O Multiplexer with 11 channels, console, DSS190 Disk Storage Subsystem with 6 drives (800 million characters), twelve MTH505 Magnetic Tape Units (133/266KC) and dual-channel control, three PRT300 Train Printers, two CRZ201 Card Readers, and CPZ201 Card Punch. Monthly rental price is $65,495.

TYPICAL MODEL 6080 SYSTEM: Same as above, with Model 6080 Central Processor in place of Model 6070. Monthly rental price is $67,295.

SOFTWARE AND SUPPORT: The Honeywell Series 6000 is being marketd as a fully "bundled" system. The equipment prices listed in this report include all the Honeywell software and all normal educational courses and professional assistance.

CONTRACT TERMS: All Series 6000 equipment is available on a 1-year, 3-year, or 5-year lease. The basic rental agreement entitles the customer to use the equipment during a Principal Period of Maintenance (PPM) consisting of the same 9 consecutive hours each day, Monday through Friday. Unlimited operation with appropriate maintenance will be provided on Monday through Friday for a premium of 50% of the basic maintenance rate. Unlimited operation with appropriate maintenance will be provided on Saturdays and/or Sundays at a premium of 20% of the basic maintenance rate for each day. Preventive maintenance will be performed outside the PPM for a premium of 10% of the basic maintenance rate. ∎

## Honeywell Series 6000

## EQUIPMENT PRICES

| | | Purchase Price | Monthly Maint. | Rental (1-year lease)* | Rental (5-year lease)* |
|---|---|---|---|---|---|
| **6030/6040 PROCESSORS & CORE STORAGE** | | | | | |
| CS6032 | 6030 Central System with 65K words** | 492,200 | 1,015 | 10,700 | 9,575 |
| CS6033 | 6030 Central System with 98K words** | 584,100 | 1,205 | 12,700 | 11,365 |
| CS6034 | 6030 Central System with 131K words** | 676,200 | 1,395 | 14,700 | 13,155 |
| CS6042 | 6040 Central System with 65K words** | 552,000 | 1,140 | 12,000 | 10,740 |
| CS6043 | 6040 Central System with 98K words** | 644,000 | 1,330 | 14,000 | 12,530 |
| CS6044 | 6040 Central System with 131K words** | 736,000 | 1,520 | 16,000 | 14,320 |
| IC6001 | Additional I/O Multiplexer Channel | 13,800 | 29 | 300 | 265 |
| CO8030 | Master Console | 20,470 | 30 | 445 | 395 |
| CO8031 | Auxiliary Console | 18,860 | 30 | 410 | 365 |
| ST8030 | Console Storage | 1,518 | 2 | 33 | 30 |
| **6050/6060 PROCESSORS & CORE STORAGE** | | | | | |
| CS6053 | 6050 Central System with 98K words** | 828,000 | 1,710 | 18,000 | 16,110 |
| CS6054 | 6050 Central System with 131K words** | 897,000 | 1,855 | 19,500 | 17,450 |
| CS6055 | 6050 Central System with 163K words** | 966,000 | 1,995 | 21,000 | 18,795 |
| CS6056 | 6050 Central System with 196K words** | 1,035,000 | 2,140 | 22,500 | 20,135 |
| CS6057 | 6050 Central System with 229K words** | 1,104,000 | 2,280 | 24,000 | 21,480 |
| CS6058 | 6050 Central System with 262K words** | 1,173,000 | 2,425 | 25,500 | 22,820 |
| CS6063 | 6060 Central System with 98K words** | 897,000 | 1,855 | 19,500 | 17,450 |
| CS6064 | 6060 Central System with 131K words** | 966,000 | 1,995 | 21,000 | 18,795 |
| CS6065 | 6060 Central System with 163K words** | 1,035,000 | 2,140 | 22,500 | 20,135 |
| CS6066 | 6060 Central System with 196K words** | 1,104,000 | 2,280 | 24,000 | 21,480 |
| CS6067 | 6060 Central System with 229K words** | 1,173,000 | 2,425 | 25,500 | 22,820 |
| CS6068 | 6060 Central System with 262K words** | 1,242,000 | 2,565 | 27,000 | 24,165 |
| CP6050 | Additional 6050 Central Processor | 253,000 | 535 | 5,500 | 4,920 |
| CP6060 | Additional 6060 Central Processor | 322,000 | 680 | 7,000 | 6,265 |
| IM6000 | Additional I/O Multiplexer with 8 channels | 207,000 | 435 | 4,500 | 4,025 |
| IC6001 | Additional I/O Multiplexer Channel | 13,800 | 29 | 300 | 265 |
| CO8030 | Master Console | 20,470 | 30 | 445 | 395 |
| CO8031 | Auxiliary Console | 18,860 | 30 | 410 | 365 |
| ST8030 | Console Storage | 1,518 | 2 | 33 | 30 |
| **6070/6080 PROCESSORS & CORE STORAGE** | | | | | |
| CS6074 | 6070 Central System with 131K words** | 1,205,200 | 2,540 | 26,200 | 23,445 |
| CS6076 | 6070 Central System with 196K words** | 1,573,200 | 3,320 | 34,200 | 30,605 |
| CS6078 | 6070 Central System with 262K words** | 1,849,200 | 3,900 | 40,200 | 35,975 |
| CS6084 | 6080 Central System with 131K words** | 1,288,000 | 2,715 | 28,000 | 25,060 |
| CS6086 | 6080 Central System with 196K words** | 1,656,000 | 3,500 | 36,000 | 32,220 |
| CS6088 | 6080 Central System with 262K words** | 1,932,000 | 4,075 | 42,000 | 37,590 |
| CS6070 | Additional 6070 Central Processor | 285,200 | 600 | 6,200 | 5,545 |
| CS6080 | Additional 6080 Central Processor | 368,000 | 775 | 8,000 | 7,160 |
| IM6000 | Additional I/O Multiplexer with 8 channels | 107,000 | 435 | 4,500 | 4,025 |
| IC6001 | Additional I/O Multiplexer Channel | 13,800 | 29 | 300 | 265 |
| CO8030 | Master Console | 20,470 | 30 | 445 | 395 |
| CP8031 | Auxiliary Console | 18,860 | 30 | 410 | 365 |
| ST8030 | Console Storage | 1,518 | 2 | 33 | 30 |
| **MASS STORAGE** | | | | | |
| DSS167 | Removable Disk Subsystem; 90 million chars. | 140,200 | 394 | 3,350 | 3,000 |
| ADU167 | Additional Disk Unit; 30 million chars. | 29,700 | 84 | 710 | 635 |
| ADC167 | Additional Data Channel (Switched) | 8,480 | 15 | 195 | 175 |
| DFP167 | Data File Protect (required on DSS167) | 2,390 | 4 | 55 | 50 |
| STC167 | Stack Command (required on DSS167) | 750 | 1 | 16 | 14 |
| DSS170 | Removable Disk Subsystem; 220 million chars. | 264,100 | 741 | 5,960 | 5,335 |
| CH0011 | High-Speed File Channel (required for DSS170) | 41,230 | 74 | 790 | 705 |
| DSS180 | Disk Storage Subsystem; 83 million chars. | 101,200 | 326 | 2,300 | 2,060 |
| DSU180 | Disk Pack Drive; 27.6 million chars. | 20,680 | 67 | 470 | 420 |
| ADC180 | Additional Data Channel (Switched) | 8,800 | 13 | 200 | 180 |
| DCH180 | Dual Simultaneous Channel | 44,000 | 141 | 1,000 | 895 |
| DFE180 | Additional Disk File Electronics | 20,240 | 65 | 460 | 410 |
| DSS190 | Disk Storage Subsystem; 266 million chars. | 162,800 | 524 | 3,700 | 3,310 |
| DSU190 | Disk Pack Drive; 133 million chars. | 28,600 | 92 | 650 | 580 |
| ADC190 | Additional Data Channel (Switched) | 8,800 | 28 | 200 | 180 |
| DCH190 | Dual Simultaneous Channel | 44,000 | 142 | 1,000 | 895 |
| DFE190 | Additional Disk File Electronics | 26,400 | 85 | 600 | 540 |
| DSU270 | Disk File Unit; 15.3 million chars. | 45,400 | 128 | 895 | 800 |
| DFE270 | Disk File Electronics Unit | 32,200 | 55 | 685 | 615 |
| DSC270 | Disk Storage Control | 55,000 | 94 | 1,260 | 1,130 |
| ADC270 | Additional Data Channel, Simultaneous | 18,400 | 32 | 420 | 375 |

* Rental prices include equipment maintenance.
** Central System includes Central Processor, 1 or 2 System Controllers (as required by memory size), and 1 I/O Multiplexer with 8 channels.

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# Honeywell Series 6000

# EQUIPMENT PRICES

| | Purchase Price | Monthly Maint. | Rental (1-year lease)* | Rental (5-year lease)* |
|---|---|---|---|---|
| **INPUT/OUTPUT UNITS** | | | | |
| **7-Track Magnetic Tape Units:** | | | | |
| MTH200  7.5/21KC, 200/556 bpi | 13,300 | 46 | 325 | 290 |
| MTH300  7.5/21/30KC, 200/556/800 bpi | 18,400 | 62 | 445 | 400 |
| MTH201  15/42KC, 200/556 bpi | 22,300 | 76 | 535 | 480 |
| MTH301  15/42/60KC, 200/556/800 bpi | 27,100 | 93 | 650 | 580 |
| MTH372  30/83KC, 200/556 bpi | 35,700 | 119 | 820 | 735 |
| MTH373  30/83/120KC, 200/556/800 bpi | 40,700 | 137 | 940 | 840 |
| **9-Track Magnetic Tape Units:** | | | | |
| MTH402  10/28KC, 200/556 bpi | 13,300 | 46 | 325 | 290 |
| MTH403  10/28/40KC, 200/556/800 bpi | 18,400 | 62 | 445 | 400 |
| MTH404  20/56KC, 200/556 bpi | 22,300 | 76 | 535 | 480 |
| MTH405  20/56/80KC, 200/556/800 bpi | 27,100 | 93 | 650 | 580 |
| MTH492  40/111KC, 200/556 bpi | 35,700 | 119 | 820 | 735 |
| MTH493  40/111/160KC, 200/556/800 bpi | 40,700 | 137 | 940 | 840 |
| MTH502  80/160KC, 800/1600 bpi | 20,460 | 81 | 465 | 415 |
| MTH505  133/266KC, 800/1600 bpi | 25,740 | 102 | 585 | 525 |
| **Magnetic Tape Control Units:** | | | | |
| MTC330  7-Track, 1x8, all speeds | 42,800 | 73 | 990 | 885 |
| MTC334  7-Track, 2x16, all speeds | 65,700 | 112 | 1,510 | 1,350 |
| MTC400  7/9-Track, 1x8, all speeds | 46,200 | 79 | 1,070 | 960 |
| MTC404  7/9-Track, 2x16, all speeds | 70,600 | 120 | 1,630 | 1,460 |
| MTC501  9-Track, 1x8, for MTH502 & MTH505 | 28,600 | 69 | 650 | 580 |
| MTC502  9-Track, 2x16, for MTH502 & MTH505 | 74,800 | 182 | 1,700 | 1,520 |
| CRZ201  Card Reader & Control; 900 cpm | 26,800 | 161 | 715 | 640 |
| CPZ201  Card Punch & Control; 300 cpm | 34,000 | 238 | 905 | 810 |
| PRT201  Printer & Control | 57,000 | 294 | 1,535 | 1,375 |
| PRT300  Train Printer & Control | 75,090 | 385 | 1,850 | 1,655 |
| —  Additional Print Train Cartridge | 3,090 | Time & Mat'ls. | 105 | 95 |
| PSC200  Manual Peripheral Switch Console (includes one OPT510 switch) | 7,850 | 14 | 185 | 165 |
| OPT510  Manual Common Peripheral Switch Unit | 1,910 | 3 | 45 | 40 |
| THS200  Manual Tape Unit Switch for 37.5/75 ips Units | 3,540 | 9 | 84 | 75 |
| THS202  Manual Tape Unit Switch for 150 ips Units | 3,540 | 9 | 84 | 75 |
| **DATANET 355 COMMUNICATIONS PROCESSOR** | | | | |
| SPA355  Processor, I/O Control, & 16K Memory | 88,320 | 179 | 1,840 | 1,645 |
| SPB355  Processor, I/O Control, & 32K Memory | 146,400 | 296 | 3,050 | 2,730 |
| ICA355  Intercomputer Adapter, including 1 port | 11,040 | 33 | 230 | 205 |
| ICP355  Additional Intercomputer Adapter Port | 4,560 | 14 | 95 | 85 |
| CPH355  High-Speed Common Peripheral Adapter | 13,200 | 40 | 275 | 245 |
| CPM355  Medium-Speed Common Peripheral Adapter | 3,600 | 11 | 75 | 65 |
| HDA355  High-Speed Device Adapter | 10,320 | 31 | 215 | 190 |
| HLA355  High-Speed Line Adapter | 30,000 | 120 | 625 | 555 |
| HSC351  High-Speed General-Purpose Channel with Automatic Call Unit | 3,360 | 15 | 70 | 60 |
| HSC355  High-Speed General-Purpose Channel | 3,120 | 14 | 65 | 55 |
| HSC356  Broad-Band Channel | 4,320 | 13 | 90 | 80 |
| HSA355  Two Asynchronous Channels; 110 to 1800 bps | 3,120 | 9 | 65 | 55 |
| HSS355  Two Synchronous Channels; 2000 to 9600 bps | 3,600 | 11 | 75 | 65 |
| HSS351  Two Synchronous Channels; with Automatic Call Unit on one; 2000 to 9600 bps | 3,800 | 11 | 80 | 70 |
| LLA355  Low-Speed Line Adapter | 24,480 | 98 | 510 | 455 |
| LSC355  Four Low-Speed Channels; 110 to 300 bps | 3,600 | 17 | 75 | 65 |
| **DATANET 305 COMMUNICATIONS PROCESSOR** | | | | |
| Model A  12 Low-Speed Communication Lines | 52,800 | 149 | 1,200 | 1,070 |
| Model B  2 Medium-Speed Communication Lines | 44,000 | 114 | 1,000 | 895 |
| Model C  12 Low-Speed and 2 Medium-Speed Communication Lines | 79,200 | 232 | 1,800 | 1,610 |
| **MOTOR/GENERATORS** | | | | |
| MG8030  31.3 KVA, 60 cycles, 208/440 volts | 12,600 | 32 | 280 | 250 |
| MG8031  62.6 KVA, 60 cycles, 440/480 volts | 15,100 | 38 | 340 | 305 |
| MG8033  62.6 KVA, 50 cycles, 380 volts | 16,100 | 41 | 360 | 320 |
| MG8034  62.6 KVA, 60 cycles, 208 volts | 15,100 | 38 | 340 | 305 |
| OPT825  Power Sequencer, 60 cycles | 800 | 1 | 18 | 16 |
| OPT826  Power Sequencer, 50 cycles | 990 | 1 | 23 | 20 |

* Rental prices include equipment maintenance.