# Honeywell Series 60, Levels 62 and 64

## MANAGEMENT SUMMARY

The Honeywell Series 60 Level 62 and Level 64 systems were two of the four computer series introduced in April 1974 as a consolidated family of computers, intended to provide a straightforward user migration path from the diversity of systems that represented Honeywell's own previous efforts plus the product lines acquired in the 1970 acquisition of General Electric's computer operations. Prior to the introduction of the Series 60 family, Honeywell's computer offerings included the Series 2000 and Series 6000 systems, as well as the older Series 100, Series 200, Series 400, and Series 600 systems. The purpose of the Series 60 family was to provide a single migration path for users of all these different systems. To facilitate the transition, Honeywell also introduced an array of conversion aids that included both hardware and software facilities to enable users to preserve their software investments.

The Series 60 product line originally consisted of four system groups, designated "levels" to reflect their relative computing power. These four system groups were based on different processors and were even designed and manufactured in different countries. The common link between the diverse groups was the Generalized Comprehensive Operating System (GCOS) or, for the largest models, an enhanced version of the Multics operating system.

In the United States, the April 1974 Series 60 product announcement included seven new processor models grouped into four "levels" of computer power. These included the Model 62/60, a small-scale system and the ➢

**The Honeywell Level 62 and Level 64 systems are, respectively, products of Honeywell Information Systems Italia in Italy and CII-Honeywell Bull in France. The Level 62 offers a migration path for users of earlier Honeywell Series 200/2000 systems and IBM System/3 computers through software conversion packages. The Level 64 was originally aimed almost exclusively at the replacement of Series 200/2000 systems through emulation, but the latest release of the GCOS Level 64 operating system permits execution of up to five native-mode jobs in addition to emulation of the earlier systems.**

## CHARACTERISTICS

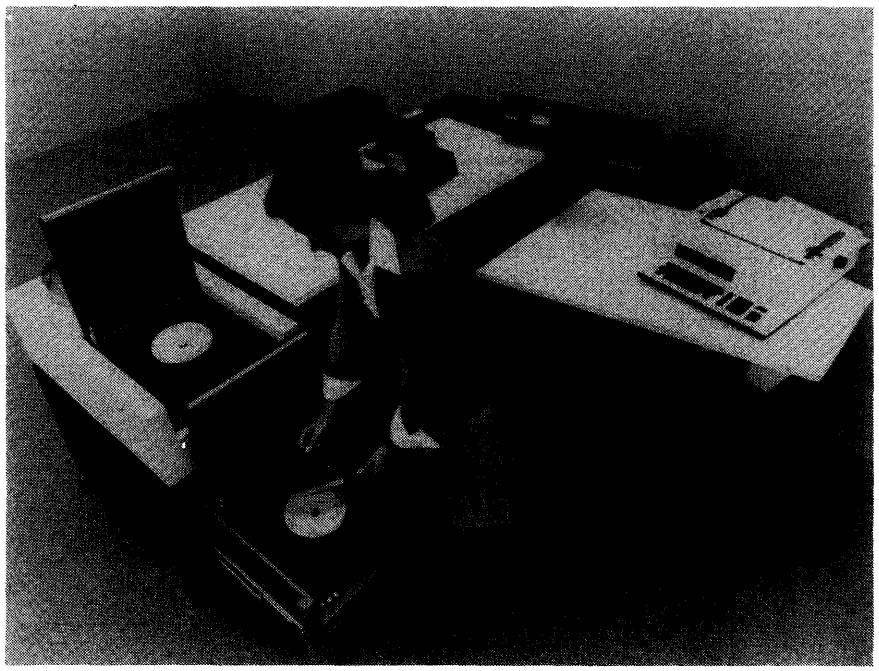
**MANUFACTURER: Honeywell Information Systems, Inc., 200 Smith Street, Waltham, Massachusetts 02154. Telephone (617) 890-8400.**

**MODELS: Series 60, Level 62; Series 60, Level 64, Models 64/20, 64/30, 64/40, 64/50 and 64/60.**

### DATA FORMATS

**BASIC UNIT: 8-bit byte plus one parity bit. In the Level 62 systems, data paths are two bytes (16 bits) wide. In the Level 64 systems, data paths are four bytes (32 bits) wide.**

**Data can be interpreted as binary, decimal, hexadecimal, or alphanumeric. Data bits are interpreted in groups of four (packed or unpacked decimal data) or eight (alphanumeric EBCDIC), or in strings of between 16 and 64 (binary digits). The strings can be interpreted as signed or fixed-point binary numbers in both the Level 62 and Level 64 CPU, and also as** ➤



*The Honeywell Series 60 Level 62 represents the lower end of the company's mainframe computer line. Originally introduced in two basic models, the Level 62 is now marketed on a component basis rather than a system basis. This small-to-medium-scale configuration includes (from left) two 80-megabyte disk pack drives, a 300-cpm card reader (96-column), a 128K-byte Model 62 CPU and control panel with two cassette tape units, and a 30-cps console printer/keyboard. This system, which also includes a 400-lpm line printer (not shown), is purchase-priced at $170,741 or leases for $3,649 per month, including maintenance, on a six-year contract.*

# Honeywell Series 60, Levels 62 and 64

## CHARACTERISTICS OF THE LEVEL 62 AND LEVEL 64 SYSTEMS

| | Level 62 | Model 64/20 | Model 64/30 | Model 64/40 | Model 64/50 | Model 64/60 |
|---|---|---|---|---|---|---|
| MAIN STORAGE | | | | | | |
| Type | MOS | MOS | MOS | MOS | MOS | MOS |
| Cycle time, nanoseconds | 1000 | 1000 | 1000 | 860/980 | 860/980 | 740/940 |
| Minimum capacity, bytes | 49,152 | 65,536 | 65,536 | 98,304 | 98,304 | 196,608 |
| Maximum capacity, bytes | 229,376 | 262,144 | 393,216 | 458,752 | 524,288 | 786,432 |
| Bytes fetched per cycle | 2 | 4 | 4 | 4 | 4 | 4 |
| CENTRAL PROCESSOR | | | | | | |
| Cycle time | 500 | 500 | 500 | 430 | 430 | 370 |
| No. of registers | 29 | 29 | 29 | 29 | 29 | 29 |
| No. of instructions | 141 std., 24 opt. | 195 | 195 | 195 | 195 | 195 |
| CONTROL MEMORY | | | | | | |
| Type | Bipolar | Bipolar | Bipolar | Bipolar | Bipolar | Bipolar |
| Cycle time | 170 | 175 | 175 | 155 | 155 | 145 |
| Capacity | 240K bits | 40 to 64KB | 40 to 64KB | 40 to 64KB | 40 to 64KB | 40 to 64KB |
| Bytes fetched per cycle | 2 (plus 4 parity bits) | 4 | 4 | 4 | 4 | 4 |
| INPUT/OUTPUT CONTROL | | | | | | |
| Maximum channels | 6 + 3 opt. | 3 | 3 | 6 | 9 | 10 |
| Maximum channel data rate, bytes per second | 1,200,000 | 1,250,000 | 1,250,000 | 1,250,000 | 1,250,000 | 1,250,000 |
| Total data rate (max.), bytes per second | 837,000 to 1,587,000 | 3,750,000 | 3,750,000 | 4,080,000 | 4,080,000 | 4,250,000 |
| CONFIGURATION | | | | | | |
| Mass storage controllers (max.) | 1 | 1 | 1 | 1 | 2 | 3 |
| Drives per controller (max.) | 6 | 4 | 8 | 8 | 8 | 8 |
| Maximum disk capacity (megabytes) | 480 | 400 | 800 | 1600 | 1600 | 2400 |
| Magnetic tape controllers (max.) | 1 | 1 | 1 | 1 | 2 | 2 |
| Magnetic tape transports (max.) | 4 | 8 | 8 | 8 | 16 | 16 |
| Unit record controllers (max.) | 4 | 1 | 1 | 2 | 2 | 2 |
| Unit record devices (max.) | 9 | 5 | 5 | 8 | 8 | 8 |
| Communications controllers (max.) | 2 | 1 | 1 | 2 | 2 | 3 |
| Communications lines (max.) | 9 | 14 | 14 | 28 | 42 | 42 |
| MONTHLY RENTAL (min. configuration) | $2,055 | $5,571 | $6,405 | $7,611 | $8,057 | $10,412 |

originally offered to compete with the expansive IBM System/3 family, particularly the System/3 Model 10. Subsequent models and enhancements added the System/3 Models 8, 12, and 15 to this list, as well as the IBM 360/20, NCR Criterion Series, and Univac's 90/25 and 90/30 computer systems. IBM's expansion of the System/3 Model 15 line caused Honeywell to elect to put an end to a similar proliferation of submodels, and, instead, offer the revamped Level 62 as a single expandable and upgradable product line.

The minimum Level 62 system includes the basic CPU with 48K bytes of main memory and a 6-channel I/O processor. The minimum configuration requires two 20.1-megabyte MSU0305 disk drives, a line printer, a system console, and either a card reader, cassette tape subsystem, diskette subsystem, or communications subsystem.

The Level 62 basic package can be expanded only to 80K bytes of main memory, and mass storage at this performance level is restricted to the 20.1-megabyte MSU0305 disk drives despite the existence of the 29.2-megabyte MSU0310 drives and the 80-megabyte

**The Level 62 central processor is divided into a CPU and an I/O control unit. The CPU consists of five functional units: the main memory control, the processor logic unit, the command generator, read-only memory (ROM), and microprogram control. The main memory control interfaces with main memory and contains addresssing and data interchange registers. The processor logic unit provides control functions to the CPU. It controls instruction fetching, decoding, and execution as well as main memory and I/O operations. The command generator decodes machine-language microinstructions from either main memory or ROM and generates appropriate control commands and transfer functions to accomplish the operations specified by the instructions. Read-only memory contains the resident microprograms needed to control the system. The internal hardware facilities of the Level 62 CPU are used chiefly for execution of these microprograms. High-speed control microprograms, such as those used for disk storage, are stored in ROM, while control microprograms for low-speed peripherals are stored in main memory. The microprogram control can address the entire 240-bit ROM or the first 64K words of main memory. It addresses, fetches, and stores data from ROM or main memory and also calculates the succeeding microinstruction address.**

**A time-of-day clock is also incorporated in the Level 62 CPU.**

**The Level 64 central processor is more sophisticated than its Level 62 counterpart, although it is divided into the same**

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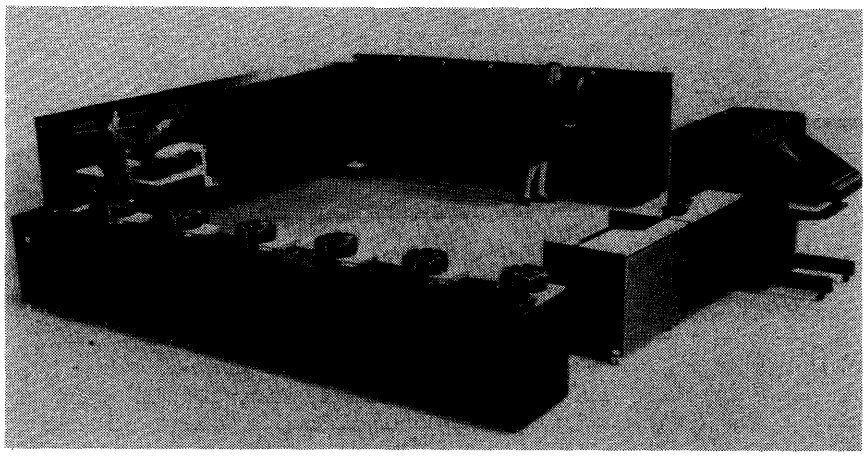

*The Honeywell Level 64 computer line is a product of CII-Honeywell Bull and is produced in France. Unlike the Level 62, it is marketed in five submodel packages. This Model 64/50 system includes (clockwise from left) a 192K-byte CPU with a system console printer/keyboard unit; main memory, peripheral processor and power cabinets; expansion cabinets for additional peripheral processors; six 9-track, 75-ips magnetic tape units; a 1600-lpm line printer; a PCU0120 card punch; a 1050-cpm card reader; and six 100-megabyte disk pack drives.*

control system, plus sales order processing and inventory management programs for distributors.

Honeywell provides a large number of conversion software routines that permit users to convert existing software for operation on the Level 62 systems. These routines permit conversion from both IBM systems and earlier Honeywell systems, and can handle IBM System/3 RPG programs and System/3 disk files, IBM 360/20 programs and files, Honeywell Series 200/2000 COBOL, Series 200/2000 Easycoder (to Level 62 COBOL), Series 200/2000 file conversion, and Honeywell Series 100 program and file conversions.

## LEVEL 64 HARDWARE

*MODEL 64/20:* The Level 64 Model 20 marks the low end of the Level 64 line and also characterizes the nucleus of all Level 64 systems. The Model 64/20 includes a CPS4206 CPU with 64K bytes of 1000-nanosecond error-correcting main memory, one 4-drive integrated mass storage processor, one 6-port integrated unit record processor, one integrated channel for magnetic tape subsystems, and a CSU4100 system console consisting of a CRT display/keyboard and/or a 30-cps serial printer. The minimum configuration must also include a card reader or reader/punch and a line printer (600 to 1600 lpm). Memory can be expanded to 256K bytes in 32K-byte increments.

Mass storage for the Model 64/20 must include a minimum of two disk drives, with a maximum of four. Level 64 users can choose up to four 29.2-megabyte MSU0310 or 100-megabyte MSU0400/0402 drives. Magnetic tape subsystems can be implemented either from MTU0210/0211 37.5-ips cluster-type drives or from MTU0410 75-ips or MTU0500 125-ips stand-alone drives. All three types of drives are available in 7-track or 9-track configurations, and 7- and 9-track drives can be intermixed within the same subsystem. The magnetic tape subsystem can contain up to eight drives. The 75-ips and 125-ips units can be intermixed in the same subsystem. A 14-line integrated communications controller can also be connected to one port of the integrated unit record processor.

**64/30, 155 nanoseconds for Models 64/40 and 64/50, and 145 nanoseconds for Model 64/60.**

**CACHE MEMORY: In the Level 64 CPU, an associative (cache) memory stores the eight most recently used segment descriptors and their associated segment numbers. This feature increases CPU performance by reducing the time required to calculate effective addresses.**

**PROCESSOR MODES: There are two modes of processor operation, master and slave. The master mode, used only by GCOS, allows unrestricted access to all of main memory, permits initiation of I/O operations, and permits setting of control registers. The slave mode is used by user programs and also by GCOS 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 registers, 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. In Level 62 and Level 64 central processors, interrupts are referred to microprogrammed routines located in the central processor read-only memory for initiation of the appropriate servicing routines.**

**CONSOLE: The Level 62 console incorporates a 30 character-per-second serial printer (optionally 120 cps); an alphanumeric typewriter keyboard; one or two optional tape cassette drives, or, mutually exclusive of the cassette tape subsystem, a single or dual diskette subsystem; and a system operator panel for monitoring the central processor and all peripheral equipment.**

**The Level 64 console provides a keyboard, a system operator panel, and one tape cassette handler. The tape cassette handler is used for system diagnostics. A 30-cps console printer or a CRT console display is optional.**

**COMPATIBILITY FEATURES: The Level 64 processors are equipeed with a standard compatibility feature that enables them to execute programs written for Honeywell Series 200/2000 Mod 1 or Series 100 systems.**

**The capabilities of the Series 200/2000 Program Mode are implemented by hardware/firmware housed in the read-only storage of the central processor and by compatibility routines that reside in system memory. The firmware routines execute Series 200/2000 instructions. Machine instructions, such as input/output operations that cannot be directly executed are passed to the compatibility software routines for interpretation and execution. In simulating Series 200/2000 memory, each Level 64 8-bit byte is formatted as the six data bits and two punctuation bits of a series 200/2000 character position.**

figurations using the same number of drives. A special dual-access magnetic tape processor must also be used in place of the standard single-access units.

*MODEL 64/50:* The Level 64 Model 50 is the second of the three systems introduced in January 1977. It provides a 30 to 40 percent performance increase over that of the Model 64/40. The basic system includes the CPS4500 CPU with 96K bytes of 860/980-nanosecond error-correcting main memory, expandable to 512K bytes in 32K and 64K-byte increments. The CPU also includes one 8-drive integrated mass storage processor, one integrated unit record processor, and one integrated magnetic tape channel. The minimum system also requires a CSU4100 system console, a card reader or reader/punch, and a line printer. As with the Model 64/40, one additional 3-port unit record processor can be added, as well as two additional 14-line integrated communications controllers.

The major differences between the 64/50 and the 64/40 are in the mass storage subsystem and in the magnetic tape subsystem. The Model 64/50 mass storage subsystem can include one additional 8-drive mass storage processor, bringing the maximum configuration to 16 disk drives.

The integrated magnetic tape channel incorporated in the CPS4500 CPU can accommodate two 8-drive magnetic tape processors. One additional channel, also capable of attaching two 8-drive magnetic tape processors, can be added. This extra channel, however, does not double the magnetic tape capacity, but permits dual-access configurations.

*MODEL 64/60:* The Level 64 Model 60 is the third Level 64 system introduced in January 1977. It provides a 20 to 30 percent performance increase over the Model 64/50. The basic system includes the CPS4600 CPU with 192K bytes of 740/940-nanosecond error-correcting main memory expandable to 768K bytes in 64K or 128K-byte increments. It can support the same 16-drive magnetic tape subsystem and the same unit record processor configurations as the Model 64/50. Unlike the Models 64/50 and 64/40, it can accommodate two additional 14-line communications controllers for a total of 42 communications lines. The Model 64/60 mass storage subsystem allows two additional 8-drive mass storage processors for a system total of 24 disk drives.

## LEVEL 64 SOFTWARE

Software support for the Level 64 systems is based on GCOS Level 64, a disk-based multi-tasking operating system for business-oriented data processing. The original GCOS Level 64 Release 100 was released in Europe in late 1975 by CII, and was intended for emulation of the EDOS operating system used in GE 100 Series equipment. Release 100 permitted two jobs to be executed concurrently, one Series 100 emulation-mode job and one native-mode job. This first release of GCOS Level 64

**The 64/50 unit record subsystem can attach up to three 14-line communications controllers.**

**The Model 64/60 can attach up to 24 disk pack drives through the integrated mass storage processor and two additional 8-drive free-standing mass storage processors. Its magnetic tape subsystem capabilities are identical to those of the Model 64/50; up to 16 tape units can be attached either in a single-access configuration or in dual-access configuration through an additional magnetic tape channel. A third 14-line communications controller can be attached to the additional URP; however, this option is mutually exclusive with the third mass storage processor.**

**When operating in the Series 200/2000 Program Mode, in conjunction with Level 64 GCOS, Release 0210, the maximum configuration supported on all systems is 256K bytes of main memory, eight magnetic tape units, eight mass storage units, two card readers, one card punch, two printers, and six communications lines.**

**SIMULTANEOUS OPERATIONS: In the Level 62 systems, program execution can proceed concurrently with data transfer operations on six overlapping input/output channels. The maximum total input/output rate of each system is 1,587,000 bytes per second.**

**The Level 64 peripheral processing subsystems can operate concurrently with the central processor. Each subsystem operates under control of a microprogrammed peripheral processor. Each peripheral processor contains its own arithmetic and logic unit, read/write memory, and read-only memory and is attached to the central system through a high-speed channel with a maximum data transfer rate of 1,250,000 bytes per second. All three channels in the Models 64/20 and 64/30 can operate simultaneously at the maximum data transfer rate, producing a maximum total data rate of 3,750,000 bytes per second. Input/output channel data rates in Models 64/40, 64/50, and 64/60 are limited only by processor memory speed. The maximum total data rate for each of these systems is listed in the Characteristics Table. All devices and terminals attached to a unit record processor can operate simultaneously. Mechanical operations on a disk or tape subsystem, such as seek and rewind, can proceed simultaneously with a data transfer on the same subsystem.**

## MASS STORAGE

**DDU001/0002 DISKETTE UNIT: This unit is available only on Level 62 systems and consists of one DDU0001 drive and optionally, one DDU0002 drive. Subsystem capacity is 256K or 512K bytes, respectively. The unit records IBM 3740-compatible diskettes by formatting data onto 77 tracks, each containing 26 sectors of 128 bytes. Average head-positioning time is 260 milliseconds, and average rotational delay is 83.3 milliseconds. Data transfer rate is 31,248 bytes per second (360 rpm).**

**MSU0112/0113/0116 MASS STORAGE UNITS: These mass storage units feature a combination of fixed-disk and removable disk cartridge storage media and were announced for the Level 62 systems in April 1975. The disk units have the capability to read cartridge disk originally created on the IBM System/3 Model 5444 and Model 5445 Disk Storage Drives. The basic subsystem configuration consists of a dual-spindle MSU0112 Mass Storage Unit, which includes one 5.8-million-byte removable disk cartridge and one 5.8-million-byte fixed disk for a total capacity of 11.6 million bytes. The same cabinet can house an additional dual-spindle MSU0116 unit containing one 5.8-million-byte fixed disk and one 5.8-million-byte removable disk cartridge, or a single-spindle MSU0113 containing one removable disk cartridge with a capacity of 5.8 million bytes.**

**Total cabinet capacity is 23.2 million bytes for an MSU0112 and MSU0116 combination. A second cabinet can house an additional MSU0112 spindle and can be expanded to include an MSU0113 or MSU0116 unit for a total subsystem capacity of 46.4 million bytes. The average head-positioning time is 40**

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Reliability and maintainability features in the Level 64 systems include several independent checking operations, although these systems lack the ability to perform diagnostics concurrently and to diagnose problems remotely. The Level 64 CPU's include five largely independent features that provide troubleshooting information. Parity is checked on every access to storage, whether mass storage or control storage. Further, parity is checked whenever data is transferred between any two system functional units. Main memory is error-correcting and detecting (EDAC) memory that appends a 6-bit error-correcting code to each 4-byte word. This code permits automatic correction of single-bit errors and flags multiple-bit errors after retrying the access. Main memory can be automatically reconfigured if a permanent error is diagnosed. Blocks of 32K bytes can be bypassed without re-initializing the systems. The Level 64 CPU's also have redundant arithmetic and logic units that duplicate each operation and compare the results.

Internal diagnostics are performed by two units within the Level 64 systems. The central processor contains microprograms implemented in firmware that checks out individual elements at initialization. The peripheral processors each have similar circuitry for performing self-tests.

The Level 64 unit record processor also functions as a system diagnostic processor. If a failure is detected in either the central processor or a peripheral subsystem, diagnostic routines are loaded into the unit record processor read/write memory, enabling it to perform system tests and report results on the system console.

### COMPETITIVE POSITION

Originally, the Level 62 systems were introduced to compete with IBM's highly popular System/3 Model 10. Many other manufacturers were also determined to capture their share of this market and introduced competing systems. Among these were NCR's Century 50 and Burroughs' B 700 systems. Honeywell's latest improvements to the Level 62 have enabled the system to meet the recent challenges issued by IBM and other vendors—specifically Univac with its 90/25 system, Burroughs with its B 800 line, and NCR with its low-end Criterion systems, the recently introduced I-8230 and I-8250.

A glance at the list of Level 62 conversion aids in the Software section of this report makes Honeywell's most immediate and direct market targets abundantly clear. In addition to the conversion software developed to migrate its current Series 200/2000 installed base to the more cost-effective hardware of the Level 62 systems, Honeywell offers software packages that enable users of IBM System/3 and System/360 Model 20 equipment to convert RPG II programs and files to Level 62 RPG. Further, the Level 62 supports 96-column cards and IBM 3741-compatible diskette input, permitting System/3 card and diskette users to migrate directly. Honeywell's CCU0501 and CCU1006 Multi-Function Card Units

**field-upgradable for double capacity in the future. The MSU0400 and the unmodified MSU0402 each provide 100 megabytes of storage, and the upgraded MSU0402 provides 200 megabytes. Each MSU0400 drive uses one M4050 disk pack, while the MSU0402 uses one M4451 disk pack. The two packs are not interchangeable, and Honeywell does not recommend intermixing the two drives. Both the M4050 and M4451 disk packs have 12 disks with 19 recording surfaces, each divided into 411 tracks. Average head positioning time is 25 milliseconds, and average rotational delay is 8.3 milliseconds (3600 rpm). Data transfer rate is 806,000 bytes per second.**

**While data transfer is taking place on one MSU0400 or MSU0402 unit, simultaneous seek operations can be performed on the other drives attached to a mass storage processor. Data protection is ensured by a validity check code in each record/sector, and write protection is a standard feature which prevents inadvertent writing on specified disk packs. Further data integrity is afforded by system-controlled offset track spacing, which permits recovering otherwise unrecoverable data.**

### INPUT/OUTPUT UNITS

**MAGNETIC TAPE UNITS: Honeywell offers a wide range of tape drives for Level 62 and Level 64 systems. Level 62 systems can attach MTU0120/0121/0111 or MTU0220/0221/0211 magnetic tape subsystems, while Level 64 systems can attach MTU0210/0211, MTU0410, or MTU0500 units. In addition, the Level 62 supports the CTU0001/0002 cassette tape units.**

**MTU0120/0121/0111 MAGNETIC TAPE UNITS: These units make up a subsystem that includes an integral controller for up to four drives. The minimum configuration requires one MTU0120 primary drive and one MTU0121 secondary drive. Up to two MTU0111 slave drives can be added to the subsystem. The drives are 18.75-ips units and are available in three configurations: 9-track, 1600 bpi, 30,000 bytes/sec.; 9-track, 800/1600 bpi, 15,000/30,000 bytes/sec.; and 7-track 200/556/800 bpi, 3750/10,425/15,000 bytes/sec. Drives with different configurations can be intermixed on one subsystem. The only restriction is that all drives must have the same tape speed. The MTU0120 primary drives attach to either port 3 or port 4 of the Level 62 CPU. The maximum configuration, however, is four drives. MTU0120/0121/0111 drives can be field-upgraded to MTU0220/0221/0211 units.**

**MTU0220/0221/0211 MAGNETIC TAPE UNITS: These units differ from the MTU0120/0121/0111 drives only in tape speed, which is 37.5 ips instead of 18.75, and in data transfer rates, which are twice as high. A minimum subsystem consists of an MTU0220 primary drive and an MTU0221 secondary drive. A four-drive subsystem can be obtained through the addition of two MTU0211 slave drives. One 4-drive subsystem can be attached to either port 3 or port 4 of the Level 62 CPU. The MTU0220/0221/0211 tape drives are offered with the same three intermixable configurations as the MTU0120/0121/0111 drives.**

**MTU0210/0211 MAGNETIC TAPE UNITS: These units are employed in clusters on Level 64 systems. A cluster consists of one MTU0210 primary drive and one to three MTU0211 secondary drives. The MTU0210/0211 drives are 37.5-ips units and are offered in three configurations that can be intermixed in the same subsystem: 9-track, 1600 bpi; 60,000 bytes/sec.; 9-track, 800/1600 bpi, 30,000/60,000 bytes/sec.; and 7-track, 200/556/800 bpi, 7,500/20,850/30,000 bytes/sec. MTU0210/0211 clusters attach to the Level 64 CPU through an MTP0200 magnetic tape processor capable of controlling up to eight drives. The MTP0200 has special format options that allow the tape drives to read or write either 9-track or 7-track tapes in several data densities, and also to read or write in Series 100 or Series 200/2000 modes. Models 64/20, 64/30, and 64/40 can attach one MTP200 processor, while Models 64/50 and 64/60 can attach up to two such processors.**

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system. Eleven of the 13 systems were rented from Honeywell, one was leased through a third party, and one was purchased. The system population included three Model 62/40's, three Model 62/60's, five Model 64/20's, and two Model 64/60's. Five of the six Level 62's were used exclusively for business data processing purposes, while one was also used for data communications applications. All seven of the Level 64 systems were employed exclusively for business data processing. Three of the seven Level 64 users relied heavily on Honeywell's Inventory Management System (IMS) for material requirements and other business planning functions and reported a high degree of satisfaction with the software.

The six Level 62 systems had been installed for between 16 and 30 months, averaging about 21 months. The seven Level 64 systems had installed lives ranging from 3 to 23 months and averaging about 13 months. Four of the six Level 62 systems had 98K bytes of main memory, while the Level 64 memory sizes varied between 128K and 256K bytes, averaging about 170K bytes for the seven systems.

Disk storage for the two systems showed little variation and was clearly divided between the two products: two or more 29-megabyte MSU0310 drives on each of the Level 62 systems surveyed, and either three or four 100-megabyte MSU0400 drives on each of the Level 64 systems.

Three of the Level 62 systems had replaced IBM System/3 Model 10's, while two others had replaced Honeywell Series 2000 equipment. The latter information was surprising, since the older Honeywell Series 200/2000 systems are the target products for the Level 64 system. Not surprising, however, was the fact that all seven Level 64's succeeded earlier Honeywell Series 200/2000 systems.

The ratings provided by the users are summarized in the following table. Two separate weighted average columns have been provided, although the user responses for both types of systems have been combined.

| | Excellent | Good | Fair | Poor | Level 62 WA* | Level 64 WA* |
|---|---|---|---|---|---|---|
| Ease of operation | 8 | 4 | 1 | 0 | 3.7 | 3.4 |
| Reliability of mainframe | 6 | 5 | 2 | 0 | 3.3 | 3.3 |
| Reliability of peripherals | 4 | 5 | 1 | 3 | 2.8 | 2.7 |
| Responsiveness of maintenance service | 5 | 6 | 2 | 0 | 3.2 | 3.3 |
| Effectiveness of maintenance service | 5 | 3 | 3 | 2 | 2.8 | 3.4 |
| Technical support | 3 | 6 | 3 | 1 | 3.0 | 2.7 |
| Operating systems | 6 | 6 | 1 | 0 | 3.5 | 3.3 |
| Compilers and assemblers | 5 | 8 | 0 | 0 | 3.5 | 3.3 |
| Applications programs | 1 | 7 | 1 | 1 | 2.4 | 3.2 |
| Ease of programming | 5 | 7 | 1 | 0 | 3.3 | 3.3 |
| Ease of conversion | 6 | 4 | 1 | 1 | 3.3 | 2.7 |
| Overall satisfaction | 8 | 3 | 0 | 2 | 3.5 | 3.1 |

*Weighted Average on a scale of 4.0 for Excellent.

Averaging the Weighted Average column for each series indicates that there was little difference in the users' satisfaction with the two systems.

for both units is also 120 cards per minute. The printing area on each 96-column card consists of 4 lines, each containing 32 characters.

Each unit includes two 2000-card input stations to provide two simultaneous card paths, one of which is used for reading and the second for reading, punching, and/or printing. Cards can be directed to any of six 1200-card output stackers under program control to perform sorting, collating, merging, interpreting, and reproducing. Data integrity features include read comparison, read cell check for each card, parity check on all data transferred between the multifunction unit and the I/O control, and read-after-punch checking. On-line error status reporting is performed under control of the central processor. The CCU0506 can be field-upgraded to a CCU-1006.

CRU0600 CARD READER: Reads 80-column or (optionally) 51-column punched cards serially by column at 600 cards per minute. The input hopper capacity is 3000 cards, and the output stacker capacity is 2500 cards. An optional mark-sense facility for either Honeywell or IBM code is available. The CRU0600 is field-upgradable to the CRU1050.

CRU1050 CARD READER: Reads 80-column or (optionally) 51-column punched cards serially by column at a 1050-cpm rate. The reader has a 3000-card input hopper and a 2500-card output stacker. An optional mark-sense facility for either Honeywell or IBM code is available.

PCU0120 CARD PUNCH: Punches 80-column cards in Hollerith or binary code at a speed of 100 to 400 cpm depending upon the number of columns punched in each card. Both the input hopper and the output stacker have a 1600-card capacity.

CCU0400 COMBINATION CARD READER AND PUNCH: Offered only with Level 64 systems, this unit reads 80-column cards serially at 600 cpm and punches 80-column cards at 100 to 400 cpm, depending on the number of columns punched per card. The input hopper capacity and the output hopper capacity are both 1600 cards.

PRU0102/0202/0303 LINE PRINTERS: These units are all versions of the same basic belt-printer mechanism and are offered only with Level 62 systems. The basic printers have 120 print positions, which can be extended to 132 positions through the PRF0001 option. Print belts are sold separately; seven print belts are offered, including six 64-character sets and one 94-character set. The 64-character belts include Honeywell Series 50/100, IBM, Honeywell 200/2000 (H1 and H2), ASCII, and Puerto Rico. The 94-character belt provides ASCII upper and lower case. Print speed depends on the number of characters in each line and the print belt used, as shown in the following table. The units also feature firmware-controlled vertical format control.

| Printer | Number of Characters | Printing Speed 120 Positions | Printing Speed 132 Positions |
|---|---|---|---|
| PRU0102 | 64 | 105 lpm | 105 lpm |
| PRU0102 | 94 | 95 lpm | 95 lpm |
| PRU0202 | 64 | 180 lpm | 180 lpm |
| PRU0202 | 94 | 155 lpm | 150 lpm |
| PRU0303 | 64 | 280 lpm | 220 lpm |
| PRU0303 | 94 | 240 lpm | 220 lpm |

PRU0400 LINE PRINTER: Available in Level 62 systems only, this unit prints 400 lpm, using a print drum having either a standard 63-character set or an optional 96-character set featuring both upper and lower case characters. Has 120 print positions, optionally expandable to 132. Prints 6 or 8 lines per inch, on continuous forms with up to 6 parts. Programmed operations include print and space, space only, skip, vertical line space, and error status reporting. The printer offers a selection of seven print drums,

# Honeywell Series 60, Levels 62 and 64

This interface can be expanded into an integrated data communications controller that supports up to four additional communications lines. The communications system can be configured as synchronous, asynchronous, or synchronous/asynchronous. A second five-line controller can also be added to the CPU.

Special addressing features to address and access communications equipment are offered in multiples of two lines: the DCA2101 provides addressing for two asynchronous lines, while the DCA2102 and DCA2103 provide addressing for two synchronous remote or direct (local) lines, respectively. A line termination adapter is required for each line: the DCF2000 and DCF2001 for asynchronous lines or the DCF2002 and DCF2003 for synchronous lines.

The Level 62 communications subsystem provides a communications throughput of up to 2400 characters per second. The maximum line capacity is 1200 characters per second. In the asynchronous mode, the following line speeds are software-selectable: 110, 150, 300, 1200, or 2400 bits per second. Synchronous line speeds to 9600 bits per second are supported. The data communications terminals initially supported include the Honeywell VIP 7700 and BTT 7340 teller terminal, the GE TermiNet 300, the Teletype Models 33, 35, 37, and 38, the IBM BSC 2780 and 3741, and ISO.

LEVEL 64: The DEC4100/4200 Communications Controller can be attached to the unit record processor. It controls up to 14 lines, in any mix of synchronous or asynchronous modes of transmission. Line speeds can range from 45 to 19,200 bits per second. The unit record processor performs all routine terminal and line handling functions. Terminal support ranges from the Teletype Model 35 up to synchronous or asynchronous CRT terminals.

## SOFTWARE

GCOS: All Series 60 systems run under either a subset or the full implementation of the GCOS operating system.

LEVEL 62 GCOS: The subset of GCOS for the small-scale Level 62 computers features multiprogramming, dynamic memory management, and fail-soft operations. Each activity is a stream of jobs to be processed by the system. Activities are associated with a given input device and are initiated by the system operator. Transition from job to job is automatic within an activity. System resources are allocated at the beginning of a job step and de-allocated at the end of a job step. If resources required for a job step are not available, the job step is placed into a "wait queue." The job is automatically started when resources become available. Jobs within an activity are executed sequentially. Jobs belonging to different activities can be processed concurrently. Any number of jobs can be processed concurrently, limited only by the amount of physical memory present in the system. GCOS also maintains a "run queue," a list of jobs ready for initiation. Whenever an executing job is interrupted, the operating system selects a ready-to-run job from the run queue and processes the job.

The dynamic main memory feature provides automatic memory management. GCOS maintains a map of the locations and sizes of all available memory areas. When a job requires additional memory space, the operating system searches the map for a suitable area and assigns the area to the requesting activity. If no single area is large enough to accommodate the request, GCOS dynamically relocates activities within memory to create one contiguous area large enough to accommodate the request.

GCOS Level 62 uses segment-relative addressing to optimize the use of main memory. All programs on a Level 62 system are executed as fully relocatable segments. Level 62 machine instructions refer to segment-relative addresses, without regard to the physical location of the referenced operand. A segment may reside anywhere in memory, and at different times may reside in different places.

With GCOS, the segments of a program are defined by the compilers and, optionally, under the control of the programmer. Segments are variable in length, permitting segmentation to follow the logic of the program and ensuring that distinct elements, such as iterative loops, are not split between segments.

When a program is ready for execution, the Initiator routine first constructs a portion of the core image on the system disk file and subsequently loads the core image into main memory.

Whenever a new segment is needed, GCOS searches main memory for a large enough space to load the segment. If there is no space large enough, GCOS relocates the segments already in memory to collect all available space into one continuous area. As a last resort, GCOS may remove the least active segment in main memory to make room for a new segment. The removed segment is only written back to the backing store if it has been changed while in memory. Instruction coding is re-entrant and is never modified. Therefore, these segments never have to be rewritten and can be overlaid. Swapping and moving of the segments is invisible to the programmer, who has apparent access to a memory capacity equal to the size of the backing store.

Job flow through the system is controlled by GCOS job management. The input reader reads the job input while other jobs are executing and translates the job control information into an internal format to speed job processing. A job scheduler schedules the execution of the jobs using a system of job classes and priorities within each class. Resources are allocated at file, volume, and device levels to each job step, and deallocated when each job step is completed. GCOS Level 62 allocates resources to job steps rather than to whole jobs to ensure effective use of the available resources. Space is allocated for files, and files are assigned to programs at the start of the job step requesting them. The files are then unassigned, and space for temporary files is normally released as soon as the job step has completed.

When assigning a file, the user defines the file as either permanent or temporary. If the user wishes to retain a temporary file for several job steps, a parameter in the ASSIGN statement prevents the file space from being released until the end of the job.

To request space for a file, the user specifies the type of device, the identity of the volume, and the amount of space required. GCOS then searches the specified volume and automatically allocates any space available. Disk space need not be contiguous; GCOS can allocate space for a file using up to 16 extents on any one volume, and can spread the file over a number of volumes if required.

When a new file is created, file management automatically creates the appropriate labels, and those are subsequently checked every time the file is opened for processing. On disk, labels are stored in a special area called the volume table of contents (VTOC). On tape, the labels are created at the head and tail of each file.

Disk files are sharable under Level 62 GCOS. However, if file protection is required, multiple access can occur only in read mode.

The GCOS Level 62 file management facilities support five file organizations: sequential, indexed, relative, queued-partitioned, and queued-linked. The latter two organizations are used only by the GCOS operating system and are invisible to users.

*Sequential files* are organized solely on the basis of their successive physical locations in the file. The records are also arranged in a logical sequence according to their keys as well as in physical sequence, and are usually read or updated in the same order they appear. For example, the hundredth

least active segment in main memory to make room for a new segment. The removed segment is only written back to the backing store if it has been changed while in memory. Instruction coding is re-entrant and is never modified. Therefore, these segments never have to be rewritten and can be overlaid. Swapping and moving of the segments is invisible to the programmer, who has apparent access to a memory capacity equal to the size of the backing store.

GCOS Level 64 protects each segment by an automatic system of rings and protection levels. This protection system is implemented in the hardware/firmware of the Level 64 systems, so it applies equally to GCOS software and to the user's own programs.

Level 64 integrity features include error logging, file security, and recovery routines. Whenever the firmware of the Level 64 system discovers an error, it notifies the appropriate routine. This notification takes place whether the firmware recovered the error or not, so that GCOS is always aware of the state of the system. The routines diagnose the error and update an error accounting area in memory. Error accounting information is used to keep track of the state of all system components and to update a permanent accounting file. This permanent file eases routine maintenance of the system; extensive error accounting information allows failing components to be identified and replaced before they cause problems.

GCOS Level 64 also includes a variety of file security aids. A save/restore utility is available for taking security copies of files, and both copies and saved generations of a file can be included in the system catalog.

GCOS includes a journal function to speed file recovery. The journal is used to save all the updates to a file since the last security copy was taken. The journal, together with the catalog and the restore utility, provide all the information needed to rebuild a damaged file to its correct state.

To reduce the possibility of a system failure, GCOS Level 64 provides a fast recovery facility in rerun support. Rerun support allows processing to be restarted immediately, either at the beginning of the job step or at the last checkpoint. The restart procedure includes automatic repositioning of the user's files and the recovery of all files and queues used by the system, including the input reader and output writer files. The output writer can restart printing at any specified block.

Job flow through the Level 64 system is controlled by GCOS job management. The input reader reads the job input while other jobs are executing and translates the job control information into an internal format to speed job processing. A job scheduler schedules the execution of the job using a system of job classes and priorities within each class. Resources are allocated at file, volume, and device levels to each job step, and deallocated when each job step is completed. Job accounting information is collected at all stages of the job's passage through the system. Job accounting information, along with the results of the job, are provided by the output writer, asynchronously with job execution.

The file management routines of GCOS handle allocation and deallocation of space for files, automatic label checking, automatic volume recognition, control of multiple concurrent accesses to files, and control of multiple copies and generations of files through the catalog. Additionally, they provide various access methods to different file organizations and also file and volume utilities to support file housekeeping.

GCOS allocates resources to job steps rather than to whole jobs to ensure effective use of the available resources. Space is allocated for files, and files are assigned to programs at the start of the job step requesting them. The files are then unassigned, and space for temporary files is normally released as soon as the job step has completed.

When assigning a file, the user defines the file as either permanent or temporary. If the user wishes to retain a temporary file for several job steps, a parameter in the ASSIGN statement prevents the file space from being released until the end of the job.

To request space for a file, the user specifies the type of device, the identity of the volume, and the amount of space required. GCOS then searches the specified volume and automatically allocates any space available. Disk space need not be contiguous; GCOS can allocate space for a file using up to five separate areas on any one volume, and can spread the file over a number of volumes if required. On magnetic tape, GCOS supports any number of files on a single tape.

When a new file is created, file management automatically creates the appropriate labels, and these are subsequently checked every time the file is opened for processing. On disk, labels are stored in a special area called the volume table of contents (VTOC). On tape, the labels are created at the head and the tail of each file.

Disk files are sharable under Level 64 GCOS. However, if file protection is required, multiple access can occur only in read mode.

Volume mounting and dismounting is controlled automatically by the system, and warnings are given if the wrong volume is used. This control is based on the volume label, which contains a unique identifier for each volume. When a volume is mounted, the automatic volume recognition feature reads its label and the identifier is stored. When space is requested or a file is opened on a specific volume, the file management system is aware of its status. If the volume is not mounted, an operator message is issued.

Among the file characteristics recorded in the file catalog are the generation number and copy number of each file. The records for different generations and copies of the same file are linked together, and the catalog automatically controls the numbering and deletion of file generations to maintain the number of generations specified by the user. Each record also contains a list of the volumes on which that copy of the file resides.

To access the latest generation of a cataloged file, the user's program refers to a file by name. This program internal name is matched to the external name of the required file when the file is assigned to that program, and the external name is used to access the catalog. The catalog automatically provides the latest generation of the required file, and supplies the file access system with the identifiers of the volume(s) on which that generation resides. Since automatic volume recognition has recorded the address of the device on which each volume is mounted, and the file label indicates the extent of the file, access to the file is complete.

The main file access system of GCOS Level 64, the Universal File Access System (UFAS), replaces random, sequential, and indexed sequential files. UFAS satisfies all the requirements of the ANSI Mass Storage Task Group recommendations for sequential, relative, and indexed access. It is independent of device characteristics, file organization, media addresses, and media formats.

Programs can access data sequentially, randomly by key, directly, or directly by relative position on the same UFAS file. The access method can change every time the file is accessed. UFAS files can be indexed or non-indexed; if indexes are used, they can be multiple-level, and records with indexed can be intermixed with records without indexes. UFAS can handle fixed-length, variable-length, and dynamically variable records, and a UFAS file can contain a mixture of different record types.

The file organization of a UFAS disk file is based on control intervals and control areas containing embedded free space, thereby eliminating the need for overflow areas. When

# Honeywell Series 60, Levels 62 and 64

sing. In addition, the Nucleus module contains enhancements to some basic functions.

Features not in COBOL-68 and added to the COBOL-74 compiler include: augmented debugging facilities that permit users to specify the debugging techniques in the program and later eliminate them from the final compilation; improved capabilities for terminal communications; the ability to call other programs, including those written in other languages; device independence for sequential files; enhanced text copying capabilities; and expanded file handling capacity, expanded sequential file functions, and improved indexed I/O techniques that effectively enlarge mass storage capacity.

The compiler is disk-resident and accepts inputs from 80- or 96-column cards or from the source unit library disk. It produces object-code modules from disk work files that can be linked into executable load modules. Users can specify different equipment environments at compile time and at execution time. Compilation can be performed from mixed peripheral inputs or the source library, since all input is integrated into common disk work files.

Comprehensive diagnostic and debugging tools are included with Level 62 COBOL. The diagnostic routines produce listings, data maps, card maps, and cross-reference listings. The debugging routines permit specification of data items and procedures to be monitored during program execution. All debugging statements can be automatically omitted from the compilation once the program is finished.

The Level 62 COBOL compiler requires 34,816 bytes of main memory, one disk unit, a printer or spooling file, and a sequential input device or source library.

LEVEL 64 COBOL: This superset of Level 62 COBOL is also based on ANSI specification X3.23-1974, but adds automatic segmentation and data communications enhancements, including an optional COBOL Data Communications Extension program module.

The Level 64 COBOL language processor automatically segments the object programs it produces. Users classify each section of a program's Procedure Division by assigning it a status level between 0 and 99. Sections assigned to level 0 are permanent segments that cannot be overlaid. Sections assigned level numbers between 1 and 49 are fixed segments, and those given numbers above 49 are independent segments and will be selected for overlaying before fixed segments. Unassigned segments are given the default assignment of level 0, and multiple segments may be assigned to the same level. This last feature is important for segments that need to communicate with each other.

Users also control the segmentation process by specifying a maximum size for both procedure and data segments. The compiler produces segments as close as possible to these limits, but they are not regarded as absolute limits. The compiler insures that no data items are split between segments and will override the user-specified limits to reduce the swapping activity that would result. Segment sizes are specified in the Environment Division of the program, enabling fine tuning without the need to change the body of the program.

Level 64 COBOL data communications capabilities include the Message Access Method, which handles all message flow between user programs and the network by establishing queues and operating from these. The COBOL communications facility consists of a Communications Section to describe the queues, and ENABLE, DISABLE, SEND, and RECEIVE verbs to communicate, via the queues, with the network. The ENABLE and DISABLE verbs are used to open and close the connection between the Message Access Method and a given terminal. The RECEIVE statement causes a message from a specified queue to be passed to the program, and the SEND verb causes a message from the program to be placed in a specified queue. An ACCEPT MESSAGE COUNT statement can also be used to access counts of messages in the queues.

The COBOL Data Communications Extension (GTC/MCS) is an optional extension to the basic COBOL ANS 74 language processor that provides language and functions representing Level 1 support of the Communications Module of th 1974 COBOL ANS Standard. These standards are based on the recommendations of the Communications Task Group (CTG) to the CODASYL Committee, which were subsequently included in the CODASYL Journal of Development for the COBOL language. These language elements include such statements as SEND, RECEIVE, ENABLE, DISABLE, etc., and provide the required prerequisite to use of the Message Access Method (MAM) as well as TDS/64. In conjunction with Basic Terminal/Network Support (BTNS), MAM serves as the Level 64 GCOS response to the CTG requirement that the COBOL program interface with a Message Control Supervisor (MCS). These products jointly provide the MCS attributes and functions necessary to conform with the ANS standards.

FORTRAN: Level 62 and Level 64 FORTRAN are essentially the same versions of ANSI FORTRAN IV with some extensions. The language processor for each level consists of two packages, the FORTRAN compiler and the FORTRAN run-time package. Both versions require the implementation of the scientific instruction set. The language processor executes either in compile-only environment (with or without the production of compile units) or in a compile-and-go environment in which the output is submitted directly to a linking loader and the resulting program is executed as part of the job stream.

Level 64 FORTRAN produces four levels of diagnostic messages. Level 1 diagnostics point out instances of code usage that could lead to less efficient execution. Level 2 diagnostics warn users of potential error conditions that could result from code usage. Level 3 diagnostics alert users to serious coding mistakes, and Level 4 diagnostics indicate fatal coding errors that would make further processing impossible. Level 4 diagnostics also cause the generation of the object program to be suppressed, but syntax checking continues. All other diagnostics do not affect compilation. Level 62 FORTRAN produces only two levels, syntax errors and fatal errors.

The Level 64 version segments the compiled output, generating a collection of "compile units" that each represent a program segment, subroutine, or data block. These compile units are written into a temporary library from which they can be cataloged into a permanent library or submitted to a linking loader for execution. The language processor further segments the compile units into code, local data, and global data. This segmentation process permits users to take advantage of the memory management facilities of GCOS and the Level 64 hardware.

Level 62 FORTRAN occupies 28,672 bytes of main memory and requires one disk unit, one printer or spooling file, and one sequential input device, input stream, or source library. The Level 64 version is automatically segmented into a virtual memory space by the GCOS memory management facilities.

RPG: The RPG language processors used in both Level 62 and Level 64 systems are virtually identical. They permit the interchange of data files among RPG, FORTRAN, and COBOL programs. Object programs written in RPG can also be linked with programs written in COBOL, FORTRAN, or other languages.

The RPG compiler features automatic file manipulation and disk handling, support for sequential, indexed, and relative file organization, physical sequential reading of indexed files, relative access to index files, device independence of sequential files, dynamic table handling capabilities, and the use of standard data management access routines by object programs.

RPG uses five files: two work files; a compute unit library for the generated program; and two input files, one for job

# Honeywell Series 60, Levels 62 and 64

## SOFTWARE PRICES

| | | Monthly License Fee | Paid-Up License |
|---|---|---|---|
| **LEVEL 62 (Continued)** | | | |
| SBU0008 | IBM 3741 Emulator Utility | 10 | NA |
| SBJ0001 | Transaction Response System | NA | 1,200 |
| SBJ0002 | Data Collection System for VIP7700 | NA | 600 |
| ABD0010 | Sales Order Processing—Order Entry Module | 81 | 2,500 |
| ABD0012 | Sales Order Procesing—Inventory Accounting Module | 54 | 1,675 |
| ABD0016 | Sales Order Processing—Billing and Shipment Module | 81 | 2,500 |
| ABD0017 | Sales Order Processing | 216 | 6,675 |
| ABD6011 | Sales Order Processing—On-Line Order Entry | 130 | 4,400 |
| ABD6013 | Sales Order Processing—On-Line Inventory Accounting; requires SBJ0001 Transaction Response System | 90 | 2,750 |
| ABD6018 | On-Line Sales Order Processing; requires SBJ0001 Transaction Response System | 301 | 9,650 |
| ABD0020 | PROFIT—Inventory Forecasting Module | 162 | 5,700 |
| ABD0021 | PROFIT—Inventory Replenishment I Module | 81 | 2,850 |
| ABD0022 | PROFIT—Inventory Replenishment II Module | 135 | 4,750 |
| ABD0023 | PROFIT—Level I | 243 | 8,550 |
| ABD0024 | PROFIT—Level II | 297 | 10,450 |
| ABF0001 | Accounts Receivable | 74 | 1,875 |
| ABF0002 | Accounts Payable | 74 | 1,875 |
| ABF0003 | General Ledger | 74 | 1,875 |
| ABF0004 | Payroll | 74 | 1,875 |
| ABF0011 | Accounts Receivable On-Line | 94 | 2,375 |
| ABF6004** | Payroll Tax Update (for ABF0004) | NA | NA** |
| ABH0001 | Hospital Accounting System (HAS/62) | 250 | 7,500 |
| ABM0002 | Production Scheduling and Control (Infinite) | 140 | 4,900 |
| ABM0012 | Production Data Management | 60 | 2,100 |
| ABM0022 | Capacity Requirement Planning/Production Control Reporting | 80 | 2,800 |
| ABM0011 | Inventory Reporting/Bill of Material Processor | 83 | 2,925 |
| ABM0041 | Material Requirements Planning | 75 | 2,650 |
| ABM0021 | Material Requirements Planning/Resource Inventory | 154 | 5,400 |
| ABM0031 | Standard Cost Control | 43 | 1,507 |

Software maintenance is required at $900 per year.
**The Payroll Update is available for an annual fee of $247 to all customers.

| | | | |
|---|---|---|---|
| SCV1000 | Series 200/2000 COBOL to Level 64 COBOL Translator | NC | — |
| SCV1005 | Series 200/2000 File Translator | NC | — |
| SCV1011 | Series 100 COBOL to Level 64 COBOL Translator | NC | — |
| SCV1012 | Series 100 File Translator | NC | — |
| SCV1003 | SORT/MERGE | 69 | — |
| SCU1006 | HFAS File Maintenance Utility Set | 10 | — |
| SCU1007 | Native-Mode Volume Utility Set | 10 | — |
| SCU1008 | BFAS/UFAS File Maintenance Utility Set | 10 | — |
| SCU1009 | Series 200/2000 Volume Utility Set | 10 | — |
| SCU1200 | Level 64 GCOS; Release 210 | NC | — |
| SCS1220 | MOD I Compatibility System for use with GCOS Release 210 | NC | — |
| SCC0201 | COBOL-68 Compiler for GCOS Release 210 | 87 | — |
| SCC0203 | COBOL-68 Data Communications Extensions | 91 | — |
| SCC0206 | FORTRAN-66 Compiler for GCOS Release 210 | 75 | — |
| SCC0208 | Easywriter for GCOS Release 210 | 35 | — |
| SCU0203 | SORT Programs for GCOS Release 210 | | |
| **LEVEL 64 SOFTWARE** | | | |
| SCS1100 | Level 64 GCOS, Basic System, Release 300 | NC | — |
| SCD1001 | Basic File Access System (BFAS) | NC | — |
| SCD1004 | Unified File Access System (UFAS) | NC | — |
| SCD1005 | Integrated Data Store (IDS-II) | 350 | — |
| SCD1007 | Series 200/2000 File Access System (HFAS) | NC | — |
| SCC1001 | COBOL-74 Compiler | 87 | — |
| SCC1003 | COBOL Data Communications Extension | 91 | — |
| SCC1006 | FORTRAN Compiler; requires scientific instructions | 75 | — |
| SCC1007 | FORTRAN Library; required with SCC1006 FORTRAN compiler | 103 | — |
| SCC1011 | RPG Compiler | 109 | — |
| SCC1001 | Message Access Method for use with SCC1003 COBOL data communications extensions; requires SCC1100 BTNS and SCC1003 extensions | NC | — |
| SCC1003 | TDS/64 Standard Processor, requires SCC1100 BTNS and SCC1003 extensions | NC | — |
| SCC1100 | Basic Terminal/Network Support (BTNS) | NC | — |
| SCM1100 | Series 100 Integrated Program Mode (Emulator); cannot be used with SCM1200 emulator | NC | — |
| SCM1200 | Series 200/2000 Integrated Program Mode (Emulator); cannot be used with SCM 1100 or emulator | NC | NC |