Honeywell Series 100

MANAGEMENT SUMMARY

The Series 100 is a line of small-scale computer systems designed and manufactured by Honeywell's Italian computer operation, Honeywell Information Systems Italia. Known as the GE-100 Series prior to Honeywell's 1970 acquisition of the General Electric Company's business computer equipment interests, the Series 100 was the first product line to result from GE's huge investment in the European computer industry. The Series 100 has achieved widespread acceptance in the international computer market; more than 2000 systems have been installed to date, and the great majority of these installations are outside the United States.

Because the Series 100's capabilities and performance overlap the lower end of the extensive Honeywell Series 200 computer family, many industry observers predicted that Honeywell would stop actively marketing the Series 100–at least within the United States–after it acquired GE's computer operations. But in July 1971, Honeywell emphasized its continuing support of the Series 100 by announcing three new "packaged" systems: Models 5, 10, and 15. Models 5 and 10 are low-cost batch terminal systems, while Model 15 is a small business data processing system with optional communications capabilities. All three of the new systems are currently available only in the United States.

The three new systems are program-compatible with the earlier Series 100 systems and use the same peripheral equipment and software. The Model 5 and Model 10 systems will be of interest primarily to companies ▷

The Italian-made Series 100 computers offer a proven combination of hardware, software, "bundled" support, and economy that qualifies them for a variety of small-scale business data processing applications. They are particularly well suited for use as remote batch terminals with larger computers.

CHARACTERISTICS

MANUFACTURER: Honeywell Information Systems Inc., 60 Walnut Street, Wellesley Hills, Mass. 02181. Telephone (617) 237-4100.

MODELS: 5, 10, 15, G-105, G-115, G-120, and G-130.

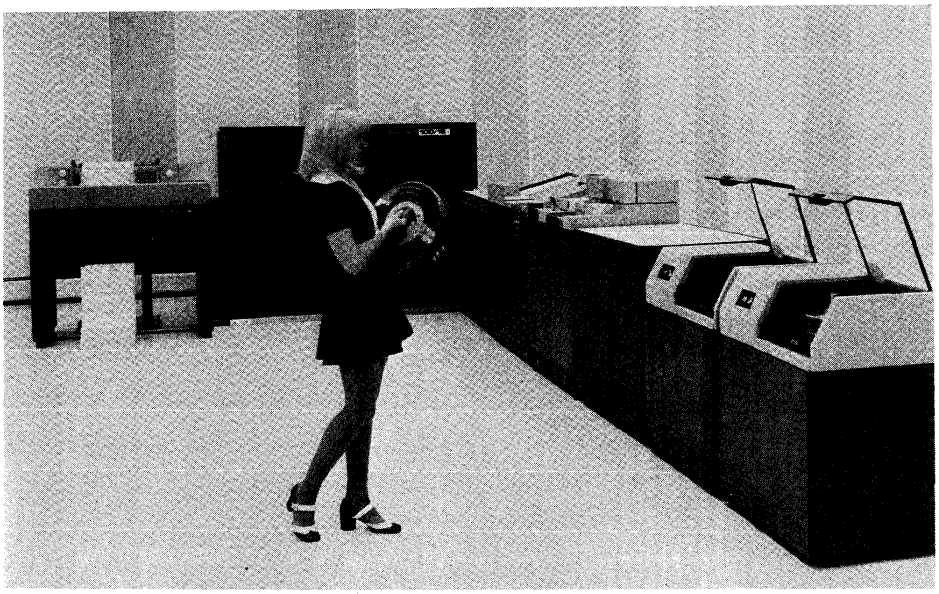
DATA FORMATS

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

FIXED-POINT OPERANDS: Can range from 1 to 16 bytes in length for arithmetic operations and from 1 to 256 bytes for data movement operations. Unpacked decimal operations process only the four rightmost bits of each byte and are unsigned. Packed decimal operations are performed upon two BCD digits in each byte, with the sign represented by the four rightmost bits of the low-order byte.

FLOATING-POINT OPERANDS: No hardware facilities; floating-point arithmetic is handled by subroutines.

INSTRUCTIONS: 2, 4, or 6 bytes in length, specifying 0, 1, or 2 memory addresses, respectively. Arithmetic ▶



The Series 100/Model 15, introduced in July 1971, is a multi-purpose system that can be used effectively as a high-volume remote batch terminal or as a stand-alone business data processing system.

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looking for flexible batch terminals for use with the Honeywell Series 6000 or other large-scale computers. The Model 15 is intended primarily as an economical upgrade system for current users of the smaller G-105, G-115 and G-120 systems. These two classes of prospects—large-scale computer users who need remote batch terminal capabilities and current Series 100 users who need more processing power—are receiving nearly all of the current Series 100 marketing emphasis. For first-time computer users or users of competitive equipment, Honeywell will generally propose one of its Model 58, Series 200, or Series 2000 systems rather than a Series 100 computer.

The G-115, first member of the Series 100, was introduced in March 1965, and customer deliveries began in April 1966. The G-115 was originally offered to the U.S. market as a remote terminal system with a very limited complement of peripheral equipment. Later, magnetic tape and disk storage capabilities were added to equip the G-115 for effective performance in most small-scale data processing applications.

The G-130 was added to the line in April 1968. It offers approximately three times the internal speed of the G-115, together with a greatly expanded instruction repertoire, index registers, an additional I/O channel, and increased core storage capacity.

The G-105 was introduced early in 1969 as the "economy model" within the Series 100. It uses the same instruction repertoire as the G-115 and is slightly slower. Neither magnetic tape nor disk storage can be used in a G-105 system. The G-105RTS (Remote Terminal System) is a special configuration of the G-105 designed to serve as a programmable communications terminal for use with larger computers made by Honeywell or other manufacturers.

The G-120 was added to the series in mid-1969 to fill the performance gap between the G-115 and G-130. The 120 has the same processing facilities as the 130 and exactly half its internal speed. Moreover, its rental price—only $156 above the corresponding G-115 Processor—made it an attractive upgrade for most users of the 115.

The Model 5 Terminal System, introduced in July 1971, is available in two versions—Standard and High-Speed. The Standard version includes a 4K central processor, 300-cpm card reader, 300-lpm printer, and a single-line communications controller in a choice of several models capable of handling data transmission speeds from 110 to 150,000 bits per second. The High-Speed Model 5 system includes an 8K central processor, 400-cpm card reader, 600-lpm printer, and single-line communications controller. Either model can be equipped with an additional 4K bytes of core storage, a 60-to-200-cpm

instructions are 6 bytes long and consist of a 1-byte operation code, a 1-byte "operation complement" that specifies the lengths of the two operands, and two 2-byte operand addresses.

INTERNAL CODE: Standard internal code is an 8-bit code that is not directly compatible with either EBCDIC or ASCII; but an effective Translate instruction facilitates code conversions.

MAIN STORAGE

STORAGE TYPE: Magnetic core.

CAPACITY: See table.

CYCLE TIME: See table.

CHECKING: Parity bit with each byte is generated during writing and checked during reading.

STORAGE PROTECTION: None.

CENTRAL PROCESSORS

INDEX REGISTERS: The Model 15, G-120, and G-130 Processors have 8 two-byte index registers located in reserved core storage locations. No indexing facilities are provided in the smaller Series 100 central processors.

INDIRECT ADDRESSING: None.

INSTRUCTION REPERTOIRE: The Model 5, 10, G-105, and G-115 Processors have 39 instructions. Arithmetic operations are limited to addition and subtraction of variable-length operands in binary and unpacked, unsigned decimal formats. Also provided are efficient facilities for data movement, comparisons, editing, searching, logical operations (AND, OR, Exclusive OR), packing, unpacking, code translation, and conditional branching.

The Model 15, G-120, and G-130 Processors have 67 instructions. In addition to all the instructions described above, they can perform addition, subtraction, multiplication, and division on signed, packed decimal operands. Also included are instructions for loading, incrementing, testing, and storing the eight index registers, as well as expanded logical and branching facilities.

INSTRUCTION TIMES: See table.

INPUT/OUTPUT CONTROL

I/O CHANNELS: There are, effectively, two channels in the Model 5, 10, G-105, and G-115 Processors and three channels in the Model 15, G-120, and G-130 Processors.

CONFIGURATION RULES: Model 5, 10, and G-105 systems have "set" configurations and permit few additions; their standard and optional components are listed in the Equipment Prices section at the end of this report.

The basic Model 15 system consists of a central processor, 400-cpm card reader, and 60-200-cpm card punch. In addition, every Model 15 configuration must include a DSS164 disk subsystem and a printer with 120 print positions and a speed of at least 600 lpm. A console typewriter is optional. Most of the other Series 100 peripheral devices can also be connected to a Model 15

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CHARACTERISTICS OF THE SERIES 100 SYSTEMS

	G-105	Model 5	Model 10	G-115	G-120	Model 15	G-130
DATE INTRODUCED	1969	1971	1971	1965	1969	1971	1968
MAIN STORAGE							
Cycle time, microseconds	7.5	6.5	6.5	6.5	4	4 or 2	2
Bytes fetched per cycle	1	1	1	1	1	1	1
Minimum capacity, bytes	4,096	4,096	8,192	4,096	12,288	16,384	16,384
Maximum capacity, bytes	8,192	12,288	12,288	16,384	24,576	65,536	32,768
PROCESSOR							
No. of instructions	39	39	39	39	67	67	67
No. of index registers	0	0	0	0	8	8	8
Instruction times, microseconds:							
Add (5 digits, unpacked)	120	114	114	114	88	88 or 44	44
Add (5 digits, packed)	*	*	*	*	68	68 or 34	34
Multiply (5 digits)	*	*	*	*	1020	1020 or 510	510
Divide (10 by 5 digits)	*	*	*	*	1648	1648 or 824	824
Move (5 bytes)	120	104	104	104	68	68 or 34	34
Compare (5 bytes)	120	114	114	114	88	88 or 44	44
Branch	30	26	26	26	20	20 or 10	10
INPUT/OUTPUT CONTROL							
No. of I/O channels	2	2	2	2	3	3	3
No. of peripheral connectors	–	3 or 4	3 or 4	4	4	4	4
Maximum simultaneous I/O operations (unbuffered)	2	2	2	2	3	3	3
Magnetic tape capability	No	Yes	Yes	Yes	Yes	Yes	Yes
Disc storage capability	No	No	Yes	Yes	Yes	Yes	Yes
Data communications capability	Yes	Yes	Yes	Yes	Yes	Yes	Yes
STANDARD PERIPHERALS							
Card reader speed, cpm	–	300 or 400	300 or 400	–	–	400	–
Card punch speed, cpm	–	–	60–200	–	–	60–200	–
Line printer speed, lpm	–	300 or 600	300 or 600	–	–	–	–
Disk storage, bytes	None	None	3 million	–	–	–	–
Communications controller	–	Standard	Standard	–	–	–	–

*Instruction not available.

card punch or 300-cpm card reader/punch, and up to two 30KB magnetic tape units.

The Model 10 Terminal System is a disk-oriented "super-terminal" that provides impressive local processing capabilities, including COBOL, FORTRAN, and LOGEL compilers and a Disk Operating System. The Model 10 is also available in Standard and High-Speed versions. The Standard Model 10 system includes an 8K central processor, 300-cpm card reader, 60-to-200-cpm card punch, 300-lpm printer, two disk pack drives with a total on-line capacity of 3 million bytes, and a single-line communications controller. The High-Speed Model 10 system has the same configuration except for the use of a 400-cpm card reader and 600-lpm printer. Either system can be equipped with an additional 4K bytes of core storage and up to two 30KB magnetic tape units.

The Model 15 is designed primarily as a small batch-oriented business data processing system, but it can also

Processor, but the only permissible magnetic tape subsystems are the MTS163 and MTS166.

The G-115 Processor has four peripheral connectors. Connectors 1 and 2 link an unbuffered printer and card reader, respectively, to integrated controllers within the processor. Connector 4 can accommodate one card punch, card reader/punch, buffered printer, paper tape reader, or single-line communications controller. Connector 3 can accommodate up to 64 peripheral devices or subsystems, including magnetic tape, disk storage, card punches, card reader/punches, buffered printers, and/or paper tape readers; Multiperipheral Adapters are required if more than one device or subsystem is attached to Connector 3. A maximum of four disk storage subsystems and four magnetic tape subsystems can be connected to a G-115.

SIMULTANEOUS OPERATIONS: Two concurrent I/O operations can be performed in a G-105 system, but internal processing is suspended during unbuffered I/O data transfers.

In Model 5, 10, and G-115 systems, the two I/O channels can be switched to handle various combinations of two simultaneous I/O operations. Internal processing is

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be used effectively as the central system in a network of Model 5 and Model 10 terminals or as a high-volume remote batch terminal linked to a larger computer. The basic Model 15 system includes a 16K central processor with a 4-microsecond cycle time, a 400-cpm card reader, and a card punch rated at 60 to 200 cpm. Not included in the price, but required in a minimum Model 15 system, are a 600-lpm (or faster) printer and a two-drive DSS164 Disk Storage Subsystem. Core storage capacity can be expanded to 24K, 32K, 49K, or 65K bytes, and a Memory Speedup feature reduces the cycle time to 2 microseconds. A console typewriter is optional. In addition, the Model 15 can be equipped with 30KB or 60KB magnetic tape drives (Model MTH163 or MTH166), up to six additional disk pack drives, and any of the other Series 100 peripherals.

The Series 100 central processor architecture is oriented toward the processing of variable-length decimal and alphanumeric operands. As in most third-generation computer systems, the basic unit of data representation is an 8-bit byte. Each byte can hold one alphanumeric character or one or two decimal digits—but the restricted instruction set of the Model 5, 10, G-105, and G-115 Processors permits decimal addition and subtraction to be performed only in the "unpacked" mode, in which each byte contains only one digit. All addressing in the Model 5, 10, G-105, and G-115 is necessarily direct, since no facilities for address modification by indexing or indirect addressing are provided. Also lacking in the four smaller processors are multiply and divide instructions, though standard subroutines are available to perform these functions.

The expanded processing capabilities of the Model 15, G-120, and G-130 Processors include complete arithmetic facilities and eight index registers. Simultaneity of all the Series 100 processors, however, is somewhat below par for third-generation computers; complex interrelationships govern the combinations of peripheral devices that can operate simultaneously with one another and with computing, and the unbuffered card readers and printers impose significant delays upon the processors. The program interrupt facility is limited to detection of interrupt signals from communications controllers.

Honeywell offers a fairly wide choice of peripheral equipment for the Series 100, including magnetic tape units, card readers, punches, and printers in an appropriate range of speeds. Also available are disk pack drives in a choice of three different on-line storage capacities. Data communications interfacing is handled by a variety of single-line controllers. A 600-dpm MICR reader/sorter was introduced by GE in an effort to tap the banking market, but Honeywell is not actively marketing the MICR capability.

suspended during magnetic tape, disk storage, and paper tape read or write operations, as well as during most of each card reading or unbuffered line printing cycle. Previously initiated operations on buffered I/O devices (card punches, reader/punches, and buffered printers) can be overlapped with unbuffered I/O operations using the same channels.

In Model 15, G-120, and G-130 systems, the three I/O channels can be switched to handle various combinations of peripheral devices. Two I/O operations can occur simultaneously with internal processing, and three simultaneous I/O operations are possible when internal processing is suspended. In addition, previously initiated operations on buffered I/O devices can be overlapped with unbuffered I/O operations on the same channels.

MASS STORAGE

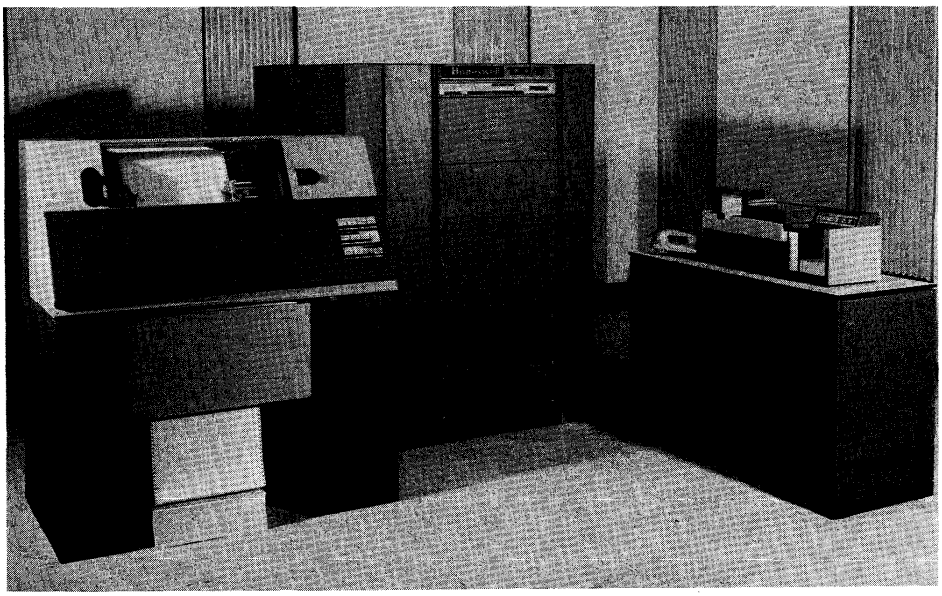
DSS130 REMOVABLE DISK STORAGE SUBSYSTEM: Provides economical random-access storage on industry-standard removable disk packs with 6 disks each. The subsystem consists of a DSC130 Disk Controller plus one to five DSU130 Disk Storage Units. Each unit holds one disk pack at a time and has a comb-type access mechanism with one head serving each of the 10 recording surfaces. There are 100 data tracks on each recording surface. Each track is normally divided into 20 addressable sectors, and each sector can hold 75 bytes, 100 six-bit alphanumeric characters, or 150 four-bit numeric digits. Total storage capacity of each disk pack is 1,500,000 bytes, 2,000,000 alphanumeric characters, or 3,000,000 numeric digits. Average head movement time is 95 milliseconds, average rotational delay is 20 milliseconds, and data transfer rate is 50,000 six-bit characters or 75,000 four-bit digits per second. (In the alternative "full track" mode, each track can hold a single record consisting of up to 2,980 alphanumeric characters or 4,470 numeric digits; data transfer rate in this mode is 77,500 characters or 116,500 digits per second.)

DSS161 REMOVABLE DISK STORAGE SUBSYSTEM: Provides moderate-capacity random-access storage on industry-standard removable disk packs with 6 disks each. The subsystem consists of a DSC161 Disk Controller plus one to eight DSU160 DIsk Storage Units. Each unit holds one disk pack at a time and has a comb-type access mechanism with one head serving each of the 10 recording surfaces. There are 200 data tracks on each recording surface. Each track is divided into 10 addressable sectors, and each sector can hold 288 bytes, 384 six-bit alphanumeric characters, or 576 four-bit numeric digits. Total storage capacity of each disk pack is 5,760,000 bytes, 7,680,000 alphanumeric characters, or 11,520,000 numeric digits. Average head movement time is 75 milliseconds, average rotational delay is 12.5 milliseconds, and data transfer rate is 208,000 six-bit characters or 312,000 four-bit digits per second.

DSS164 REMOVABLE DISK STORAGE SUBSYSTEM: Provides moderate-capacity random-access storage for Model 15 systems on industry-standard removable disk packs (Honeywell M4005 or equivalent) with 6 disks each. The basic DSS164 subsystem consists of a control unit and two single-spindle disk drives. Up to six additional drives can be added in increments of two. Each drive holds one disk pack at a time and has a comb-type access mechanism with one head serving each of the 10 recording surfaces. Each track is divided into 10 addressable sectors, and each sector can hold 288 bytes,

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The Series 100/Model 5 is an economical remote batch terminal that provides printed output at 300 or 600 lpm and card input at 300 or 400 cpm. Magnetic tape and card punching capabilities are optional.

The Series 100 software complement is fairly impressive in its scope. Users of tape or disk systems can do their programming in assembly language, COBOL, FORTRAN, or RPG. Five different operating systems are available, but all are straightforward batch monitors with no multiprogramming capabilities. The library of application programs for the Series 100 contains a number of useful packages but is far less comprehensive than the Honeywell Series 200 program library.

Within the Series 100, there is a high degree of upward compatibility in both hardware and software. The expanded instruction repertoires and assembly languages of the Model 15, G-120, and G-130 systems include all the facilities of the four smaller models, so programs written for a Model 5, 10, G-105, or G-115 system can easily be run on any of the larger systems.

There is no program compatibility, at the machine or assembly-language level, between the Series 100 systems and other computers from Honeywell or competitive manufacturers. The Series 100 COBOL and FORTRAN compilers, however, are in reasonable accord with the current American standards for these languages, and an IBM-compatible Report Program Generator is available for the Model 15, G-120, and G-130. The 8-bit internal code used in the Series 100 is neither ASCII nor EBCDIC, but a code translation instruction facilitates conversion to and from the standard codes. The 7- and 9-track tape handlers for the Series 100 use IBM-compatible recording formats. Although the Series 100 disk storage units are standard 6-disk packs, their recording formats differ from the ones used in IBM disk drives.

In summary, the Series 100 computer systems, while lacking any outstanding virtues, present a nicely

384 six-bit alphanumeric characters, or 576 four-bit numeric digits.

Total storage capacity of the basic two-drive DSS164 subsystem is 5,760,000 bytes, 7,680,000 alphanumeric characters, or 11,520,000 numeric digits. The optional ADS164 Capacity Expansion feature doubles the storage capacity of the basic subsystem by increasing the number of cylinders (i.e., data tracks on each recording surface) from 100 to 200. Each additional two-drive ADU164 increment increases the subsystem capacity by 11,520,000 bytes, 15,360,000 alphanumeric characters, or 23,040,000 numeric digits. Average head movement time is 75 milliseconds, average rotational delay is 12.5 milliseconds, and data transfer rate is 208,000 six-bit characters or 312,000 four-bit digits per second.

INPUT/OUTPUT UNITS

MAGNETIC TAPE SUBSYSTEMS: Read and record data on standard 1/2-inch tape in IBM-compatible formats. Each subsystem consists of a controller and up to six tape handlers (or up to four of the MTH110 and MTH111 or eight of the MTH163 and MTH166 Handlers). The newer MTH101, MTH110, MTH111, MTH163, and MTH166 Handlers feature a single-capstan drive mechanism for reduced tape wear and simplified operation. Characteristics of the available tape handlers are summarized below in terms of number of tracks, tape speeds (in inches per second), recording densities (in bits per inch), and data transfer rates (in bytes or characters per second).

MTH101: 9 tracks: 18.75 ips; 800 bpi; 15,000 bytes/sec.

MTH103: 9 tracks; 37.5 ips; 800 bpi; 30,000 bytes/sec (option permits 7-track operation at 200, 556, or 800 bpi).

MTH110: 7 tracks; 18.75 ips; 200 or 556 bpi; 3,750 or 10,400 char/sec.

MTH111: 7 tracks; 18.75 ips; 200, 556, or 800 bpi; 3,750 to 15,000 char/sec.

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balanced combination of hardware, software, economy, and "bundled" support that make them effective performers in remote batch terminal applications and in selected small-scale business data processing installations. □

MTH163: 9 tracks; 18.75 ips; 1,600 bpi; 30,000 bytes/sec (options permit operation in 9-track mode at 800 bpi and/or 7-track mode at 200, 556, or 800 bpi).

MTH166: 9 tracks; 37.5 ips; 1,600 bpi; 60,000 bytes/sec (options permit operation in 9-track mode at 800 bpi and/or 7-track mode at 200, 556, or 800 bpi).

CRZ100 CARD READER: Reads 80-column cards serially by column at 300 cpm. Can read Hollerith and column binary codes. Has a 500-card feed hopper and single 500-card stacker. Connects to the integrated card reader controller of a Series 100 Processor.

CRZ111 CARD READER: Reads 80-column cards serially by column at 400 cpm. Can read Hollerith and column binary codes. Has a 2000-card feed hopper, a 2000-card primary stacker, and a program-selectable 500-card auxiliary stacker. An option permits reading of 51-column cards. Connects to the integrated card controller of a Series 100 Processor.

CRZ120 CARD READER: Has all the characteristics of the CRZ111 Reader, above, plus a higher speed of 600 cpm.

CPZ101 CARD PUNCH: Punches 80-column cards serially by column at 60 to 200 cpm, depending upon the number of columns punched. Can punch Hollerith and column binary codes. Has a 1500-card feed hopper and single 1500-card stacker. Contains an integral controller and buffer.

CPZ103 CARD PUNCH: Punches 80-column cards in parallel, row-by-row fashion at 300 cpm. Can punch Hollerith and column binary codes. Has a 1200-card feed hopper, a 1200-card primary stacker, and a 100-card auxiliary stacker. Contains an integral controller and buffer.

CRP100 CARD READER/PUNCH: Can read, punch, or read and punch simultaneously at the rate of 300 cpm. Both reading and punching are done in row-by-row fashion, in Hollerith or column binary code (or both codes intermixed). Has two feed hoppers and three output stackers; the primary hopper and stacker hold 3,000 cards each. Contains an integral controller and buffers.

PTR100 PAPER TAPE READER: Reads 5-, 7-, or 8-level punched tape photoelectrically at 500 char/sec. Eight-inch supply and take-up reels hold 1,000 feet of tape. Contains an integral controller.

PTP110 Paper Tape Punch: Punches 5-, 7-, or 8-level tape at 60 char/sec. Contains an integral controller.

PTP120 PAPER TAPE PUNCH: Punches 5-, 6-, 7-, or 8-level tape at 150 char/sec. Contains an integral controller. (This unit is not available on new orders.)

CTW101 CONSOLE TYPEWRITER: Usable only with the Model 15. Consists of a typewriter-style keyboard, 74-position printer, 8-level paper tape reader and punch, control panel, and controller with a 255-character buffer and interrupt timer. Rated speed is 10 characters/second.

PRT100 PRINTER: Prints 300 lines per minute, using all 64 graphic characters on the rotating print drum. Has 104 print positions, optionally expandable to 120 or 136 positions. Skipping speed is 17 inches per second, and vertical format is controlled by a paper tape loop. A Fast Skip option provides a skipping speed of 63 inches per second on skips of more than 3 lines. Accommodates continuous forms from 3.5 to 22 inches in width. Connects to the integrated (unbuffered) printer controller of a Series 100 Processor.

PRT110 PRINTER: Has all the characteristics of the PRT100 Printer, above, plus a higher speed of 620 lpm when all 64 characters are used.

PRT120 BUFFERED PRINTER: Prints 620 lines per minute when all 64 graphic characters are used, or 780 lpm when printing is restricted to a set of 48 contiguous characters. Has 120 print positions, optionally expandable to 136. Skipping speed is 17 inches per second; a Fast Skip option provides a speed of 63 inches per second on skips of more than 3 lines. Vertical format is controlled by a paper tape loop. Accommodates continuous forms from 3.25 to 22 inches in width. Contains an integrated controller and buffer.

PRT130 BUFFERED PRINTER: Has all the characteristics of the PRT120 Printer, above, plus a higher speed of 830 lpm when all characters are used or 1100 lpm for a 48-character subset. The Fast Skip feature is standard.

MRS101 DOCUMENT READER/SORTER: Reads and sorts MICR-encoded documents at a speed of up to 600 six-inch documents per minute. Usable for on-line MICR input or off-line sorting. Has 10 sorting pockets and 1 reject pocket. Handles documents from 5.8 to 8.75 inches in length and 2.5 to 4.25 inches in width. (This unit is not available on new orders.)

MANUAL PERIPHERAL SWITCHES: Permit manual switching of the physical connections between Series 100 processors and peripheral subsystems. The PSU100 is used to switch one processor connector between two peripheral subsystems, while the PSU101 is used to switch one peripheral subsystem between two different processors.

COMMUNICATIONS CONTROL

SINGLE-LINE COMMUNICATIONS CONTROLLERS: These devices equip a Series 100 Processor to transmit and receive data over a single communications line. Most models perform a transverse parity check on each character and a longitudinal parity check on each message. The available models and their principal characteristics are as follows:

SLC100: Operates in half-duplex, synchronous mode at 2000 bps over switched voice-grade lines or 2400 bps over a private line, using ASCII code.

SLC102: Operates in half-duplex, synchronous mode at 19,200, 40,800, or 50,000 bps, using ASCII code.

SLC111: Operates in half-duplex, asynchronous mode at 110, 150, 300, 600, or 1200 bps, using ASCII code.

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SLC112: Operates in half-duplex, synchronous mode over Telpak lines at up to 150,000 bps, using ASCII code.

SLC113: Operates in half-duplex, synchronous mode at 2000 or 2400 bps, using ASCII code.

SLC114: Operates in half-duplex, synchronous mode at up to 150,000 bps, using ASCII code.

SLC115: Operates in half-duplex synchronous mode at up to 2400 bps, using XS3 code.

SINGLE-LINE ADAPTERS: Equip the Single-Line Communications Controller which is built into every Model 5 or 10 Processor with the specific type of interface required. The available models and their principal characteristics are as follows:

SLA111: Operates in half-duplex, asynchronous mode at 110 to 1200 bps, using ASCII code.

SLA112: Operates in half-duplex, synchronous mode at up to 150,000 bps over Telpak lines, using ASCII code.

SLA113: Operates in half-duplex, synchronous mode at 2000 or 2400 bps, using ASCII code.

SLA114: Operates in half-duplex, synchronous mode at up to 150,000 bps over voice-grade or conditioned lines, using ASCII code.

SLA115: Operates in half-duplex, synchronous mode at 2000, 2400, or 4800 bps, using XS3 code.

SOFTWARE

Software support for the Series 100 is furnished at five basic levels, designed for:

Card-oriented systems (any model) with as little as 4K bytes of core storage.

Magnetic tape-oriented G-115 systems with at least 8K bytes.

Disk-oriented Model 10 and G-115 systems with at least 8K bytes.

Magnetic tape-oriented G-120 and G-130 systems with at least 12K bytes.

Disk-oriented Model 15, G-120, and G-130 systems with at least 16K bytes.

An operating system is associated with each software level; these systems are described in the following paragraphs.

CARD OPERATING SYSTEM: COS is a set of simple routines that facilitate the assembly, loading, and execution of user programs on card-oriented Series 100 systems. The main components of COS are a loader, a Basic Input/Output System (BIOS) that handles card reader and printer operations in accordance with user-supplied parameters, and a series of subroutines that control the operations of the card punch, when used. The Basic APS and LOGEL 1 language translators, as well as a variety of utility routines and subroutines, can be used under COS.

TAPE OPERATING SYSTEM: TOS is a simple batch-mode operating system designed to facilitate the operation of tape-oriented G-115 systems. It requires an 8K processor with card reader, printer, and 3 magnetic tape handlers. Under the direction of system control cards, TOS handles the loading, processing, termination, and linking of successive jobs with a minimum of operator intervention.

DISK OPERATING SYSTEM: DOS is a simple batch-mode operating system for disk-oriented Model 10 and G-115 systems. It requires an 8K processor with card reader, printer, and 2 disk drives. Larger storage capacities, magnetic tape handlers, and other peripheral devices are also supported. DOS requires the first 1600 bytes of core storage, plus an additional 500 bytes if magnetic tape is used. Under the direction of system control cards, DOS handles the loading, processing, termination, and linking of successive jobs. Facilities for compilation, debugging, and library maintenance are also provided. Other features of DOS include device-independent I/O and standardized communications between the operator and all programs. DOS maintains three important program files: (1) the System Disk, which holds compilers, utility programs, subroutines, system management programs, etc.; (2) the Library Disk, which contains debugged user programs; and (3) the Master Disk, which holds all the linked-together programs that are to constitute the job flow within the system for a given period of time.

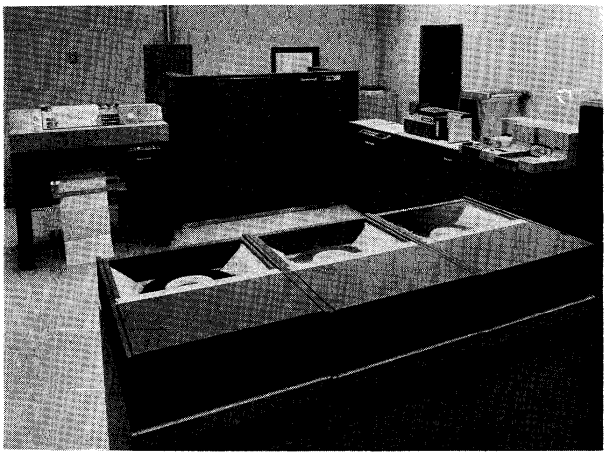
EXTENDED TAPE OPERATING SYSTEM: ETOS is a batch-mode operating system for tape-oriented G-120 and G-130 systems. It requires a 12K G-120 or 16K G-130 processor, card reader, printer, and 4 magnetic tape handlers. ETOS also requires a reserved area of approximately 2400 bytes of core storage to hold the Supervisor and other necessary routines and data. Under the direction of system control cards, ETOS handles the loading, processing, termination, and linking of successive jobs. Programs can be assembled or compiled, tested, debugged, inserted into a library tape, maintained, and executed through the use of ETOS and its related software facilities.

EXTENDED DISK OPERATING SYSTEM: EDOS is a batch-mode operating system for disk-oriented Model 15, G-120, and G-130 systems. It requires a 16K processor, card reader, printer, and 2 disk drives and can support a variety of other peripheral equipment, including the recently announced console typewriter for the Model 15. The EDOS Supervisor requires the first 4000 bytes of core storage, plus another 1000 bytes if magnetic tape is used. The facilities and features of EDOS are essentially the same as those of DOS, as described above.

COBOL: Honeywell offers COBOL compilers for tape and disk-oriented Series 100 systems. The compilers for the Model 10 and G-115 require a 12K processor, card reader, printer, and either 2 disk drives (for operation under DOS) or 4 tape drives (for operation under TOS, on the GE-115 only). The compilers for the Model 15, G-120, and G-130 require a 16K processor, card reader, printer, and either 4 tape handlers (for operation under ETOS) or 2 disk drives (for operation under EDOS). There are no significant differences in the COBOL language elements implemented in the various compilers. Series 100 COBOL is a reasonably comprehensive implementation of the ANS COBOL-65 language. It includes the Random Access, Report Writer, and Segmentation features which are missing from many competitive COBOL compilers, as well

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Honeywell Series 100



The G-115, introduced in 1965, was the pioneer member of the Series 100 family and is still in widespread use around the world.

as facilities for the inclusion of subprograms written in assembly language. Among the COBOL-65 facilities which are not included in Series 100 COBOL are the Sort and Library modules.

FORTRAN: Honeywell offers FORTRAN compilers for operation under DOS, TOS, EDOS, or ETOS on Series 100 systems with at least 12K bytes of core storage and either 2 disk drives or 4 magnetic tape handlers. (A card reader and printer are also required in all cases.) The source language is essentially ANS Basic FORTRAN, with a few useful extensions such as the Logical IF statement, the ability to use 6-character names, and a segmentation facility.

LOGEL: A "medium-level" programming language, designed to facilitate the coding of programs for report writing and other common business data processing functions on small Series 100 systems. LOGEL (for LOgic GEnerating Language) is comparatively easy to learn and use. Source programs are written on fixed-format coding sheets and composed of five divisions: General, which describes the I/O media and peripheral devices; Input, which describes the input records to be processed; Data, which defines the data fields, work areas, and constants; Calculation, which defines the processing to be performed; and Format, which describes the output records to be produced. There are three different versions of LOGEL:

LOGEL 1 provides a basic program-generating capability and can be used on a 4K system with card reader, punch, and printer. It provides 28 instructions and can handle only one input file, one output file, and one printed report per program. The LOGEL 1 processor generates a Basic APS source program which is then assembled to produce the desired object program.

LOGEL 2 is an extension of LOGEL 1 for use on 8K card systems. It provides 58 instructions and can process two input files and produce up to three output files plus a printed report.

LOGEL 3 is a further extension, designed for use on 8K Model 10 or G-115 systems with card reader, printer, and either three magnetic tape handlers or two disk drives. It can handle up to 10 files, in various combinations, plus a printed report. The LOGEL 3 processor generates an Extended APS program that can be assembled and executed under either TOS or DOS. Programs written in LOGEL 1 and 2 can be compiled by the LOGEL 3 processor.

RPG: The Series 100 Report Program Generator enables users of the larger Series 100 systems to write business data processing programs in the widely-used IBM RPG language. Data from five types of user-prepared specification sheets (File Description, File Extension, Input, Calculation, and Output-Format) is used to generate machine-language object programs. Any combination of up to 10 files can be handled in an RPG object program, and disk files can be organized in sequential, indexed sequential, or random fashion. The RPG processor runs under either ETOS or EDOS and requires at least a 12K Model 15, G-120, or G-130 Processor with card reader, printer, and either two disk drives or three magnetic tape units.

ASSEMBLY PROGRAMMING SYSTEM: APS is the symbolic programming language used to write machine-oriented programs for the GE-100 Series systems. It is provided in three different, upward-compatible versions: (1) Basic APS, for card-oriented systems; (2) Extended APS, for tape and disk-oriented Model 10 and G-115 systems running under TOS or DOS; and (3) APS-15, for disk-oriented Model 15, G-120, and G-130 systems running under EDOS.

Basic APS is a simple one-for-one assembler that permits the use of mnemonic operation codes and symbolic addresses. It also provides a number of pseudo-instructions that control the assembly process, reserve storage areas, define data fields and constants, and define I/O operations. The programmer uses a fixed-format coding sheet, and the assembly process requires two passes of the source program deck. Basic Input/Output System (BIOS) subroutines can be incorporated into the Basic APS programs to facilitate I/O programming.

Extended APS provides all the facilities of Basic APS plus macro-instructions and program segmentation facilities. Macros are provided for input/output, multiplication, division, signed addition and subtraction, radix conversions, and a variety of other functions. The segmentation facilities make it possible to divide a program into logical segments and overlay these segments in core storage.

APS-15 permits full use of the expanded instruction repertoires of the Model 15, G-120, and G-130 Processors, as well as an extensive library of macro-instructions. Programs written in either of the lower-level versions of APS can be assembled by APS-15.

UTILITY ROUTINES: Input/output control systems facilitate the coding of I/O operations. The Basic Input/Output System (BIOS) is a set of subroutines that handle reading and writing of physical records on card units, printers, and magnetic tape units. The Extended Input/Output System (EIOS) is a set of macro-instructions that handle the input and output of logical records on tape and disk-oriented Series 100 systems.

Tape and disk sort/merge generators are available for Series 100 systems with at least 8K bytes and either three tape handlers or two disk drives.

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Each level of Series 100 software support also includes an appropriate complement of data transcription, diagnostic, and other utility routines.

COMMUNICATIONS SOFTWARE: To support the use of its Series 100 computers as remote terminals, Honeywell offers four distinct software packages:

GRTS-100: Handles communications, in a remote job entry mode, between a Series 100 system and a central Honeywell Series 400, 600, or 6000 computer system.

DOS-GRTS-100: Extends the capabilities of GRTS-100 by adding the capability to receive and transmit data from disk files as well as punched cards and printers.

RT1108: Enables a Series 100 computer to function as a remote terminal for a central UNIVAC 1108 computer system.

Remote Terminal Routine Package: Provides subroutines to facilitate the control of communications, via a single half-duplex telephone line, either between two Series 100 computers or between a Series 100 and a "noncompatible" computer.

APPLICATION PROGRAMS: The limited number of Honeywell packages available for the Series 100 computers includes:

Inventory Management System
Cost implosion for the Inventory Management System
Billing and Accounts Receivable System
Accounts Payable System
Production Scheduling and Control System I
Margin for Wholesale Grocery Business
Scientific Color Matching
Critical Path Method
SIMTAB Interpretive Report Program Generator

PRICING

EQUIPMENT: The following systems are typical of the types of Series 100 systems that are currently being installed and are supported by standard Honeywell software. All necessary control units and adapters are included in the indicated prices, and all rentals include equipment maintenance.

SMALL MODEL 5 REMOTE TERMINAL: Consists of 4K Model 5 Processor, 300-cpm Card Reader, 300-lpm Printer, and Single-Line Communications Controller with Adapter. Monthly rental and purchase prices are $983 and $37,860, respectively.

EXPANDED MODEL 10 REMOTE TERMINAL: Consists of 12K Model 10 Processor, 3 million bytes of disk storage (2 drives), 400-cpm Card Reader, 60-200-cpm Card Punch, 600-lpm Printer, and Single-Line Communications Controller with Adapter. Monthly rental and purchase prices are $2,501 and $98,615, respectively.

MODEL 15 DISK SYSTEM: Consists of 16K Model 15 Processor, 2-drive DSS164 Disk Storage Subsystem (11.52 million bytes), 600-cpm Card Reader, 60-200-cpm Card Punch, and 780-lpm Buffered Printer. Monthly rental and purchase prices are $3,827 and $149,145, respectively.

SOFTWARE AND SUPPORT: Honeywell has not "unbundled" to date, so the equipment prices listed in this report include all software in the Honeywell Program Library, reasonable amounts of documentation, and systems support and training in accordance with specific commitments agreed to by Honeywell management.

CONTRACT TERMS: The Series 100 equipment is available for purchase or for use under a 1-year, 3-year, or 5-year lease. The basic monthly rental charges entitle the lessee to scheduled use and maintenance during up to nine consecutive hours per day between the hours of 7 a.m. and 6 p.m., Monday through Friday. For scheduled usage beyond this period, with on-call maintenance service, the user pays an additional charge which is a fixed percentage of the basic monthly maintenance charge, as follows:

Monday through Friday, 9-16 hrs./day:	30%
Monday through Friday, 16-24 hrs./day:	50%
Saturdays, 0-9 hrs./day:	10%
Saturdays, 16-24 hrs./day:	20%
Sundays, 0-9 hrs./day:	10%
Sundays, 9-24 hrs./day:	20% ■

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Honeywell Series 100

EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	Rental (1-year lease)*	Rental (5-year lease)*
MODELS 5 AND 10					
1M053A	Model 5 Central Processor with 4K bytes, 300-cpm Card Reader, 300-cpm Printer, and Single-Line Communication Controller	37,440	209	973	872
1M053B	Model 5 CP with 8K bytes, 300-cpm Card Reader, 300-lpm Printer, and SLCC	42,640	226	1,109	992
1M056B	Model 5 CP with 8K bytes, 400-cpm Card Reader, 600-lpm Printer, and SLCC	52,000	310	1,352	1,211
1M056C	Model 5 CP with 12K bytes, 400-cpm Card Reader, 600-lpm Printer, and SLCC	57,200	335	1,487	1,331
1M103B	Model 10 Central Processor with 8K bytes, 300-cpm Card Reader, 60-200-cpm Card Punch, 300-lpm Printer, Single-Line Communications Controller, 3 million bytes of Disk Storage, and Multiperipheral Adapter	82,205	468	2,085	1,866
1M103C	Model 10 Central Processor with 12K bytes and same peripherals as 1M103B, above	87,535	493	2,220	1,986
1M106B	Model 10 Central Processor with 8K bytes, 400-cpm Card Reader, 60-200 cpm Card Punch, 600-lpm Printer, Single-Line Communications Controller, 3 million bytes of Disk Storage, and Multiperipheral Adapter	92,865	535	2,356	2,108
1M106C	Model 10 Central Processor with 12K bytes and same peripherals as 1M106B, above	98,195	561	2,491	2,229
CPZ101	Card Punch and Control; 60-200 cpm (for Model 5)	11,670	77	328	291
CRP100	Card Reader/Punch and Control; 300 cpm (for Model 5 only)	21,510	153	614	551
MTS103	Magnetic Tape Unit and Control; 30 KC	24,360	149	603	541
MTH103	Additional 30 KC Tape Unit for MTS103	11,430	88	333	296
OPT007	7-Track Compatibility for MTS103	2,500	3	57	51
PTO316	Extension of Print Positions from 120 to 136 (for 300-lpm Printer)	1,470	10	36	36
SPA005	Single-Peripheral Adapter (for Model 5 only)	2,100	0	52	47
MPA005	Multiperipheral Adapter (for Model 5 only)	5,040	6	125	111
PTO616	Extension of Print Positions from 120 to 136 (for 600-lpm Printer)	1,890	12	47	42
SLA111	Single-Line Adapter	420	0	10	10
SLA112	Single-Line Adapter (Telpak option)	4,200	30	104	94
SLA113	Single-Line Adapter	420	0	10	10
SLA114	Single-Line Adapter	420	0	10	10
SLA115	Single-Line Adapter	420	0	10	10
CSO600	Card Reader Upgrade (from 400 to 600 cpm)	1,440	16	47	42
MODEL 15					
1M156D	Model 15 Central Processor with 16K bytes, 400-cpm Card Reader, and 60-200-cpm Card Punch	79,590	287	1,971	1,764
1M156F	Model 15 Central Processor with 24K bytes, 400-cpm Card Reader, and 60-200-cpm Card Punch	92,190	325	2,283	2,044
1M156H	Model 15 Central Processor with 32K bytes, 400-cpm Card Reader, and 60-200-cpm Card Punch	104,790	362	2,595	2,322
1M156L	Model 15 Central Processor with 49K bytes, 400-cpm Card Reader, and 60-200-cpm Card Punch (MSOP15 CP Upgrade is required)	146,790	443	3,635	3,250
1M156P	Model 15 Central Processor with 65K bytes, 400-cpm Card Reader, and 60-200-cpm Card Punch (MSOP15 CP Upgrade is required)	171,990	524	4,259	3,812
MSOP15	Central Processor Upgrade (from 4 to 2-microsecond cycle time)	8,820	32	218	196
CSO600	Card-Reader Upgrade (from 400 to 600-cpm)	1,440	16	47	42
DSS164	Two Disk Pack Drives and Control; 5.76 million bytes	29,280	210	634	567
ADS164	Capacity Expansion (5.76 million more bytes for DSS164)	6,000	32	239	218
ADU164	Two Additional Disk Pack Drives; 11.52 million bytes	28,600	159	676	605
CTW101	Console Typewriter	10,500	45	275	240

Note: In addition to the peripherals included in the basic systems, a Model 15 must include a DSS164 disk subsystem and a printer with 120 print positions and a speed of at least 600 lpm. Most of the other Series 100 peripheral devices can also be used in a Model 15 system, except that the only permissible magnetic tape subsystems are the MTS163 and MTS166.

*Rental prices include equipment maintenance.

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Honeywell Series 100

EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	Rental (1-year lease)*	Rental (5-year lease)*
MODEL G-105					
105A04	G-105A Central Processor with 4K Memory, 350-cpm Reader, 60-200-cpm Punch, and 250-lpm Printer	47,300	285	1,300	1,165
105B08	G-105B Central Processor with 8K Memory, 300-cpm Reader/ Punch, and 300-lpm Printer	54,900	329	1,508	1,352
105RT1	G-105 Remote Terminal System with 4K Memory, 300-cpm Reader, 250-lpm Printer, and 2000/2400-bps Synchronous Single-Line Communications Controller for ASCII code	45,600	209	1,191	1,066
105RT2	Same as 105RT1, except for XS3 communications code	45,600	209	1,191	1,066
AMM105	4K Additional Memory Module (for 105A04, 105RT1, or 105RT2)	7,870	17	187	167
OPT105	16 Additional Print Positions (for any G-105 system)	1,250	10	36	36
PTR100	Paper Tape Reader; 500 cps (for 105A04 or 105B08)	4,520	28	125	111
CPZ101	Card Punch; 60-200 cpm (for 105RT1 or 105RT2)	11,670	77	328	291
G-115, G-120, & G-130 PROCESSORS					
115A04	G-115 Central Processor, 4K Memory	25,440	43	593	530
115A08	G-115 Central Processor, 8K Memory	30,910	60	728	650
115A12	G-115 Central Processor, 12K Memory	41,760	86	988	884
115A16	G-115 Central Processor, 16K Memory	52,800	108	1,248	1,118
MPA115	Multiperipheral Adapter for G-115	3,075	6	73	66
120A12	G-120 Central Processor, 12K Memory	46,750	135	1,144	1,024
120A16	G-120 Central Processor, 16K Memory	57,600	161	1,404	1,258
120A24	G-120 Central Processor, 24K Memory	70,320	199	1,716	1,534
120A32	G-120 Central Processor, 32K Memory	92,640	237	2,236	2,002
MPA120	Multiperipheral Adapter for G-120	3,340	5	78	70
130A16	G-130 Central Processor, 16K Memory	88,800	161	2,080	1,862
130A24	G-130 Central Processor, 24K Memory	111,120	199	2,600	2,330
130A32	G-130 Central Processor, 32K Memory	133,440	237	3,120	2,792
MPA130	Multiperipheral Adapter for G-130	3,312	6	78	70
MASS STORAGE					
DSC130	Disk Control (for up to 5 DSU130 Drives)	13,055	30	312	281
DSU130	Disk Pack Drive (1.5 million bytes)	10,705	56	286	256
DSS161	Disk Storage Subsystem (controller and 2 DSU160 Drives; 11.52 million bytes)	48,360	198	1,695	1,518
DSU160	Additional Disk Pack Drive (5.76 million bytes)	15,780	80	645	577
INPUT/OUTPUT UNITS					
MTS101	Basic Magnetic Tape Subsystem; 9 tracks, 15KB (controller and 1 handler)	30,096	78	728	650
MTH101	Magnetic Tape Handler; 9 tracks, 15KB	10,128	42	260	233
OPT171	7-Track Compatibility Option (1 required per MTS101 subsystem)	2,208	4	52	47
MTC103	Magnetic Tape Controller; 9 tracks, 30KB	18,870	61	468	421
MTH103	Magnetic Tape Handler; 9 tracks, 30KB	11,430	88	333	296
OPT007	7-Track Compatibility Option (1 required per handler)	2,500	3	57	51
MTS110	Basic Magnetic Tape Subsystem; 7 tracks, 10.4KC (controller and 1 handler)	20,880	70	520	468
MTH110	Magnetic Tape handler; 7 tracks, 10.4KC	8,450	42	224	200
MTS111	Basic Magnetic Tape Subsystem; 7 tracks, 15KC (controller and 1 handler)	23,280	70	572	511
MTH111	Magnetic Tape Handler; 7 tracks, 15KC	10,128	42	260	233
MTS163	Magnetic Tape Subsystem; 9 tracks, 30KB (controller and 1 handler)	34,416	89	832	744
MTH163	Magnetic Tape Handler; 9 tracks, 30KB	12,240	48	312	281
OPT183	200/556/800 bpi Recording Density Option (1 required per subsystem)	8,832	17	208	186
OPT173	7 Tracks, 200/556/800 bpi Option (1 required per handler)	1,008	4	26	26
OPT193	9 Tracks, 800 bpi Option (1 required per handler)	1,008	4	26	26

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EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	Rental (1-year lease)*	Rental (5-year lease)*
INPUT/OUTPUT UNITS (continued)					
MTS166	Magnetic Tape Subsystem; 9 tracks, 60KB (controller and 1 handler)	51,744	131	1,248	1,118
MTH166	Magnetic Tape Handler; 9 tracks, 60KB	18,528	69	468	421
OPT186	200/556/800 bpi Recording Density Option (1 required per subsystem)	8,832	17	208	186
OPT176	7 Tracks, 200/556/800 bpi Option (1 required per handler)	1,008	4	26	26
OPT196	9 Tracks, 800 bpi Option (1 required per handler)	1,008	4	26	26
CRZ100	Card Reader; 300 cpm	5,760	32	156	139
CRZ111	Card Reader; 400 cpm	8,880	48	239	214
OPT024	51-Column Card Option (for CRZ111)	2,016	9	52	47
CRZ120	Card Reader; 600 cpm	10,320	65	286	256
OPT025	51-Column Card Option (for CRZ120)	1,300	9	36	36
CRP100	Card Reader/Punch and Control; 300 cpm	21,510	153	614	551
CPZ101	Card Punch and Control; 60-200 cpm	11,670	77	328	291
CPZ103	Card Punch and Control; 300 cpm	22,420	148	629	562
PRT100	Printer; 300 lpm, 104 columns	15,120	108	432	385
OPT075	120 Column Option	1,300	9	36	36
OPT076	136 Column Option	2,545	18	73	66
OPT080	Fast Skip Option (63 ips)	2,545	18	73	66
PRT110	Printer; 600 lpm, 104 columns	22,080	156	629	562
OPT077	120 Column Option	1,635	12	47	42
OPT078	136 Column Option	3,270	24	94	84
OPT079	Fast Skip Option (63 ips)	2,545	18	73	66
PRT120	Buffered Printer; 780 lpm, 120 columns	32,835	232	936	837
OPT085	136 Column Option	3,650	26	104	94
OPT086	Fast Skip Option	2,545	18	73	66
PRT130	Buffered Printer; 1110 lpm, 120 columns	40,175	283	1,144	1,024
OPT087	136 Column Option	3,650	26	104	94
PTR100	Paper Tape Reader; 500 cps	4,520	28	125	111
PTP110	Paper Tape Punch; 60 cps	4,080	27	114	102
PSC100	Manual Switch Console and one PSU100; Single CPU	6,480	27	166	149
PSC101	Manual Switch Console and one PSU101; Dual CPU	6,480	27	166	149
PSU100	Additional Manual Switch; Single CPU	1,632	6	42	37
PSU101	Additional Manual Switch; Dual CPU	1,632	6	42	37
COMMUNICATION CONTROLS					
SLC100	Single-Line, Synchronous, 2000/2400 bps	9,320	17	218	196
SLC102	Single-Line Synchronous, 19,200/40,800/50,000 bps	12,100	52	312	280
SLC111	Single-Line Asynchronous, 110-1200 bps	8,592	33	218	196
SLC112	Single-Line, Synchronous, up to 150,000 bps	12,288	47	312	280
SLC113	Single-Line Synchronous, 2000/2400 bps	8,592	33	218	196
SLC114	Single-Line Synchronous, variable speed	8,592	33	218	196
SLC115	Single-Line Synchronous, 2000/2400 bps	8,592	33	218	196

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