NCR Century Series

MANAGEMENT SUMMARY

The present family of NCR Century Series computers consists of eight disc-oriented models released over a period of six years. Middle-of-the-range systems in the family include the Century 100 and 200 processors (the original members of the NCR Century Series announced in March 1968), the Century 101 (released in April 1972), and the two newest additions to the product line, the Century 151 and Century 201 (announced in May 1974). The product line is rounded out at the top by the Century 251 (released in January 1973) and the Century 300 (announced in September 1970), and in the small-scale performance category by the Century 50 (unveiled in December 1970).

With the Century 300 offering more than 25 times the internal performance of the Century 50, the Century Series offers a broad range of upward-compatible systems. In addition, NCR is prepared to offer its multiprocessor Century 350 system in the United States. The Century 350 occupies a unique position in the NCR computer product line, with specially designed software support oriented toward large-scale multiprocessing in on-line financial applications.

As originally introduced, the Century Series represented a belated but impressive entry into the third-generation computer sweepstakes, with an appropriate complement of peripheral equipment and software for the hotly contested small-scale business data processing marketplace. Early announcement of a larger, more powerful processor was promised at the time the Century 100 and 200 were announced, but it was more than two years before the third, most powerful member of the family was released.

At the time of its release, the long-promised Century 300 processor provided a natural growth path for in- ▷

NCR's Century Series computers span a wide range of computational capabilities from the small-scale Century 50 to the large-scale Century 300. Recent activity within the product line includes the announcement of 200-million-byte disc drives, larger main memory sizes and enhanced multiprogramming for the Century 101, and selected rental and maintenance price increases.

CHARACTERISTICS

MANUFACTURER: NCR Corporation, Dayton, Ohio 45409. Telephone (513) 449-2000.

MODELS: NCR Century 50, 50 Mod 1, 100, 101, 151, 200, 201, 251, and 300 Computer Systems.

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. (Four consecutive bytes form a "word" in the Century 251 and Century 300 systems.)

FIXED-POINT OPERANDS: Can range from 1 to 256 bytes in length, in either decimal or binary mode. (On the Century 251 and 300, a "word binary" mode is available that takes particular advantage of their 4-byte adders; each 4-byte word is treated as a signed 31-bit integer.)

FLOATING-POINT OPERANDS: Consist of a 7-bit hexadecimal exponent and a 24-bit or 56-bit fraction (in "short" or "long" format, respectively).

INSTRUCTIONS: 4 or 8 bytes in length, specifying 1 or 2 memory addresses, respectively.

INTERNAL CODE: ASCII.

MAIN STORAGE

STORAGE TYPE: Thin-film, short-rod for Century 50, Century 100, and Century 200 systems with up to 49K ▶

The NCR Century 201, introduced in May 1974, provides raw processing power roughly equal to that of the original Century 200 but features expanded I/O capabilities for connection of larger and faster disc storage units. A basic 64K Century 201 system with 96 million bytes of disc storage can be rented for $6,625 per month on a 1-year lease.

stalled Century 200 systems and helped to promote acceptance of the smaller Century 100 and 200 systems by providing tangible evidence of the capability for upward growth with full compatibility.

In reality, however, the price/performance gap between the Century 200 and 300 proved to be too wide for the majority of Century 200 users, and the Century 251 was developed three years later as a more practical upgrade for the more than 800 Century 200 systems then installed worldwide.

The low end of the Century Series product line was set by the December 1970 unveiling of the Century 50, which embodies some striking technical features for an entry system in its class. Thus, the range of Century processing capability was established by the end of 1970, and has not since been extended. But significant additional activity has taken place within the Century Series, including 1) the release of additional, intermediate processors, 2) dramatic developments in peripheral availability resulting from the NCR-CDC joint venture, and 3) further development of an already extensive line of commercially oriented application software—more than 50 major systems, many of which include multiple, separately usable program subsystems.

RECENT DEVELOPMENTS

Throughout the life cycle of the Century Series, price reductions and performance enhancements have kept the series cost-competitive and have helped stave off incursions of competitive mainframe vendors into the NCR installed base. The company has also continued to provide enhancements to strengthen the systems' performance in on-line and multiprogramming environments, in addition to providing attractively priced upgrade systems for its customer base.

In May 1974 NCR announced two new intermediate systems—the Century 151 and Century 201—aimed at upgrading the more than 3,000 Century 100, 101, and 200 systems installed at that time. In addition, the company announced a doubled main memory capacity for the Century 251 system, a specially priced Century 251 configuration eligible for three- and five-year rental terms, a new complement of peripheral devices including a 100-million-byte disc unit, and significant purchase and rental price reductions.

A second round of enhancements followed a little over a year later, in August 1975. This time NCR doubled the main memory capacity available for Century 101 systems, adding 96K-byte and 128K-byte core memory sizes, and reduced the rental for the Century 101 48K- and 64K-byte memory sizes. Other hardware enhancements to the Century 101 included a buffered I/O trunk to allow use of the Model 657 Dual-Density Disc Unit with a capacity of 96 million bytes per disc pack and an interface for the 796-101 Visual Display Unit to be used as a system console. Other hardware enhancements announced for the Century 151 in August 1975 include a Time of Day clock for monitoring system performance and support for the 100- or 200-million-byte Model 658 disc drives.

bytes; each plated copper rod stores 1 bit and is 0.006 inch in diameter and 0.110 inch long. Conventional magnetic core storage is used for the Century 101, for expanded Century 200 systems (64K bytes or larger), and all Century 201, 251, and 300 systems. The Century 151 has metal oxide semiconductor (MOS) main memory.

CAPACITY: See table. Specific memory sizes available for each processor are summarized below.

Century 50 Mod 1: 16,384 or 32,768 bytes.
Century 50 or 100: 16,384 or 32,768 bytes.
Century 101: 16,384; 24,516; 32,768; 49,152; 65,536; 98,304; or 131,072 bytes.
Century 151: 32,768; 49,152; 65,536; 98,304; or 131,072 bytes.
Century 200: 32,768; 49,152; 65,536; 98,304; 131,072; 196,608; 262,144; 393,216; or 524,288 bytes.
Century 201: 65,536; 98,304; 131,672; 196,608; 262,144; 393,215; or 524,288 bytes.
Century 251: 98,304; 131,072; 196,608; 262,144; 393,216; or 524,288 bytes.
Century 300: 131,072 to 4,194,304 bytes. A Century 300 system can include from 1 to 8 Memory Storage Units (MSU's) containing 131,072, 262,144, 393,216, or 524,288 bytes each. Each MSU consists of four equal-sized memory modules that cycle independently of each other.

CYCLE TIME: See table. In the Century 251, word addresses are interleaved among two memory modules within the MSU to permit overlapped accessing. In the Century 300, word addresses are interleaved among four memory modules within each MSU to permit overlapped accessing. The Century 251 and 300 can access one, two, or three bytes during each cycle instead of the standard four bytes.

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

STORAGE PROTECTION: None in the Century 50, 50 Mod 1, or 100. Provided by the optional Multiprogramming Feature for the Century 101, 151, 200, and 201. In the Century 251 and 300, storage protection is provided by multiple base address and limit registers. For each active program, one base address register (BAR) and one limit address register (LAR) define the lower and upper address limits of main storage that can be accessed.

RESERVED STORAGE: In the Century 50 through 201 Processors, byte locations 0 through 1279 are reserved for registers, control words, and the resident executive. In the Century 251, byte locations 0 through 3071 are reserved for registers, control words, and specific portions of the resident executive. In the Century 300, byte locations 0 through 3071 are reserved for these purposes.

CENTRAL PROCESSORS

INDEX REGISTERS: The Century 50 through 201 provide 63 index registers, located in main storage. In the Century 251 and 300 a separate set of 63 index registers is maintained in reserved storage for each active program.

INDIRECT ADDRESSING: None in the Century 50 or 100; up to 5 levels in the Century 101, 151, 200, 201, 251, and 300, which can be combined with indexing.

INSTRUCTION REPERTOIRE: The Century 50 and 100 each have 19 instructions: decimal add and subtract, binary add and subtract, move, compare, pack, unpack, repeat, wait, input/output, and 8 different branch instructions. Arithmetic can be performed only in unpacked decimal and binary modes, upon unsigned fields up to 256 bytes in length. Standard subroutines are used for multiplication and division.

The Century 101 and Century 151 have 34 standard instructions, including all of the Century 50 or 100 instructions plus optional instructions for multiply and divide and a Command feature for logical bit manipulation.

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▷ NCR's pricing policy represents a reasonable "middle road" between the overall package pricing that has been traditional for the computer industry and the complete separation of hardware and software prices, which is becoming more common among mainframe vendors as the cost of producing software assumes a larger portion of the overall cost of manufacturing a computer system. At present, however, NCR supplies with the Century systems the basic software support, programming languages, and training required for system implementation, with additional software, support, and education conveniently available to users who need this further assistance and are willing to pay for it.

PERIPHERAL EQUIPMENT

In May 1974 NCR introduced a bevy of new peripheral products manufactured by Computer Peripherals, Incorporated, including the following I/O devices:

● The Model 684-301 Card Punch and its companion upgrade model, the 684-101 Card/Read Punch. Both models feature speeds of 100 cards per minute when punching 80 columns and a maximum of 460 cards per minute when punching a single column per card. The read/punch model reads 80-column cards at speeds of 500 cards per minute and can read and punch Hollerith or binary code in a single pass or in separate passes.

● Two new printers employing a horizontal moving train with changeable train arrays. The medium-speed 646 Printer operates at 1,200 lines per minute with a 48-character set and at burst speeds of up to 2,500 lines per minute with customized train configurations. The high-speed Model 647 Printer operates at 2,000 lines per minute with a 48-character set, with burst speeds of up to 3,500 lines per minute with a specially tailored print train. Two new print trains were released for these printers in August 1975: a 57-character train array with the ANSI OCR-A character set and a 96-character array with upper and lower case characters. Model 647 is available for Century 101, 151, 200, 201, 251, and 300 systems; Model 646, however, is not available with Century 200 or 201 configurations.

● Two new families of magnetic tape units, both offering cost savings over previous models. The 634 Magnetic Tape Subsystems provide low- and medium-speed tape handling capabilities with data transfer speeds ranging from 4K to 80K bytes per second. The NCR 634 features a "master/slave" configuration, in which the master unit includes both control electronics and one tape drive and can control up to three additional slave tape units. Both 7- and 9-track drives are available. The 9-track NCR 634 models can handle both NRZI at a density of 800 bits per inch and phase-encoded recording at 1600 bits per inch. The two new NCR 635 Magnetic Tape Units are high-performance drives capable of data transfer rates of up to 320K bytes per second at 1600 bits per inch. Both models read and write on 9-track tape using the phase encoding technique, with NRZI available as an option. Up to eight 635 tape units can be connected to a 624-401 Magnetic Tape Control Unit. Although the NCR 634 and 635 Magnetic Tape ▷

▶ and data transfer rate depend upon which of two controllers is used:

● The 625-201 Disc Controller records data at a density of 2200 bpi. Maximum data capacity is 7459 bytes per track, 149,180 bytes per cylinder, and 29.8 million bytes per 11-disc pack. Data transfer rate is 315,000 bytes/second. Available for the Century 101, 151, 200, 201, 251, and 300, the 625-201 can control up to eight 657-type spindles for a total on-line capacity of 238.4 million bytes.

● The 625-202 Dual-Density Disc Controller can record data at either 2200 or 3500 bpi, under programmed control. Maximum data capacity at the higher density is 11,944 bytes per track, 238,880 bytes per cylinder, and 47.7 million bytes per pack. Data transfer rate is 500,000 bytes/second. Available for the Century 101, 151, 201, 251, and 300, the 625-202 can control up to eight 657-type spindles for a total on-line capacity of 381.6 million bytes.

658-201 DISC SUBSYSTEM: Provides large-capacity random-access storage in interchangeable 10-high disc packs. The 658-201 subsystem has a capacity of 100 million bytes per drive but can be field-upgraded to a capacity of 200 million bytes per disc drive. It uses the NCR 958-2 Disc Pack, which has 19 tracks in each of 404 data cylinders plus 7 spares, and a basic capacity of up to 100 million bytes per disc pack. In the 200-million-byte recording mode, each 958-2 Disc Pack contains 808 cylinders plus 15 spares for a capacity of up to 200 million bytes. The double disc pack capacity is achieved through use of the NCR 0658-0002 Feature, which is required on each disc drive in the subsystem. Up to eight 658-201 Disc Units in either 100-million-byte or 200-million-byte format can be attached to a 658-301 Control Unit. Attachment of additional disc drives, up to maximum of 16 drives per control unit, requires the optional NCR 0625-0002 Drive Expansion Feature.

The 658-201 subsystem is available for Century 151, 201, 251, and 300 systems and can be intermixed with other disc subsystems already in use on these computer systems. The 658 Disc Subsystem has a head movement time that ranges from 10 to 55 milliseconds and averages 30 for random accesses. Average rotational delay is 8.4 milliseconds, and data transfer rate is 806,000 bytes per second. Rotational Position Sensing and Command Retry are standard features. Error correction circuitry in the control unit permits detection and correction of errors in 11-bit bursts of data or address information. The Model 625-301 Control Unit contains a magnetic tape cassette handler for loading the control program, loading and reading on-line and off-line diagnostic programs, and recording statistical usage/error logging data. In addition, the control unit utilizes interchangeable address plugs to facilitate servicing of individual disc drives.

INPUT/OUTPUT UNITS

633 MAGNETIC TAPE HANDLERS: Six models of CDC-built 633 Series tape units are offered. Data transfer rates range from 10,000 to 240,000 bytes/sec. All use standard 1/2-inch tape, have vacuum-capstan drives, and use photocell sensing. Up to 8 tape units can be connected to a 624-type control unit. The following models are available:

633-111: 9 tracks; phase-encoded; 1600 bytes/inch; 80,000 bytes/sec. Forward tape speed 50 ips, rewind speed 150 ips. Requires 624-111 Controller.

633-117: 7 tracks; NRZI; 200, 556, or 800 char/inch; 10,000, 27,800, or 40,000 char/sec. Forward tape speed 50 ips; rewind speed 150 ips. Requires 624-179 Controller.

633-119: 9 tracks; NRZI; 800 bytes/inch; 40,000 char/sec. Forward tape speed 50 ips; rewind speed 150 ips. Requires 624-119 or 624-179 Controller.

633-121: Dual-drive unit with same characteristics as 633-111.

633-211: 9 tracks; phase-encoded; 1600 bytes/inch; 144,000 bytes/sec. Forward tape speed 90 ips; rewind ▶

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▷ Units offer no new breakthrough in magnetic tape technology (such as the IBM 6250 bits-per-inch tape density), they provide magnetic tape capability at considerably more attractive cost/performance levels than previous models for NCR Century Series users.

NCR also announced the Model 658 Disc Subsystem in May 1974. In its original version, the subsystem could include up to 16 disc drives, each with a 100-million-byte capacity, and was available only for Century 251 and 300 systems. The disc drives were upgraded to a 200-million-byte capacity in August 1975 with the announcement of a 200-Million-Byte Feature for the 658 Disc Units, and the availability of the 658 was extended downward in the Century product line to include Century 151 and 201 processors as well as the larger 251 and 300.

THE CENTURY 50

The "new" NCR Century 50, unveiled in April 1974 and designated the Century 50 Mod 1, is a somewhat slower and significantly cost-reduced version of the original entry-level Century 50 unveiled in 1970. The Century 50 Mod 1 basic configuration consists of a central processor with 16,384 bytes of main memory, a dual-spindle disc drive with a 153-millisecond access time and an on-line storage capacity of 8.4 million bytes, a 125-1pm printer, and a 300-cpm card reader. Monthly rental is $1,385 under a one-year contract or $1,150 under a five-year contract, and the purchase price is $47,000.

Though the Century 50 offers little that is new in the way of hardware or software technology, it does embody most of the technological innovations that have distinguished the Century Series since its introduction. Monolithic integrated circuits are used extensively, and NCR's distinctive thin-film, short-rod memory provides a fast cycle time of 800 nanoseconds per one-byte access. Every Century 50 system includes at least one dual-spindle disc unit, with 12 read/write heads serving each of the 6 recording surfaces of each removable 3-disc pack. Moreover, all of the Century Series software is disc-oriented, and even the smallest Century 50 system can utilize an integrated operating system and COBOL, BASIC, and FORTRAN compilers.

The Century 50 Processor has the same data formats, instruction repertoire, memory cycle time, and instruction execution times as the Century 100 Processor. To get the price down, NCR reduced the speeds of the basic printer and disc unit and somewhat restricted the possibilities for connecting additional peripheral equipment. Like the Century 100, the Century 50 processors has a limited repertoire of just 19 instructions. Addition and subtraction can be performed only in binary or unpacked decimal mode, upon unsigned fields ranging from 1 to 256 bytes in length. Since few users will program the Century 50 at the machine-instruction level, the limited instruction set is not likely to cause programming difficulties. However, the Century 50 must use subroutines to perform multiplication, division, editing, code translation, and other operations that can be accomplished by single machine instructions in many larger computers.

When originally announced, the Century 50 was bound by strict configuration rules. Since that time, the rules ▷

▶ speed 240 ips. Requires 624-211 Controller. Not usable with Century 100.

633-311: 9 tracks; phase-encoded, 1600 bytes/inch; 240,000 bytes/sec. Forward tape speed 150 ips; rewind speed 380 ips. Requires 624-311 Controller. Not usable with Century 100.

634 MAGNETIC TAPE SYSTEM: The NCR 634 Series tape units provide low-speed tape handling capabilities for 7- and 9-track magnetic tape. The 634 Series employs a "master/slave" operating technique in which each "master" unit contains a tape drive, the control electronics, and the trunk interface, and can control up to three additional "slave" units each containing a tape drive and associated read/write electronics. Three master units and three slave units are available; 9-track master tape units with the dual-mode option permit NRZI and phase-encoded tape units to be intermixed in one master/slave combination. The following "master" units and their associated "slave" units are available:

634-117 Master Unit: 7 tracks; NRZI; 200/556/800 bits/inch; 5,000/13,900/20,000 char/second. Forward tape speed is 25 ips; rewind speed is 160 ips.

634-107 Slave Unit: 7 tracks; 200/556/800 bits/inch; 5,000/13,900/20,000 char/sec.

634-119 Master Unit: 9 tracks; phase encoded or dual mode (phase encoded and NRZI); 1600 bytes/inch (phase encoded)/800 bytes per inch (NRZI); 40,000/20,000 bytes/sec. Forward tape speed is 25 ips; rewind speed is 160 ips.

634-109 Slave Unit; 9 tracks; phase encoded and/or NRZI; 1600 bytes/inch (phase encoded)/800 bytes/inch (NRZI); 40,000/20,000 bytes/sec.

634-107 Slave Unit (described above).

634-219 Master Unit: 9 tracks; phase encoded or dual mode (phase encoded and NRZI); 1600 bytes/inch (phase encoded)/800 bytes/inch (NRZI); 80,000/40,000 bytes/sec. Forward tape speed is 50 ips; rewind speed is 160 ips.

634-209 Slave Units; 9 track; phase encoded or dual mode; 1600 bytes/inch (phase encoded)/800 bytes/inch (NRZI); 80,000/40,000 bytes/sec.

634-107 Slave Unit (described above).

635 MAGNETIC TAPE SYSTEM: The NCR 635 Magnetic Tape Units are high-performance, 9-track tape drives that can read or write data with either the NRZI or phase encoded recording techniques. Up to eight Model 635 Magnetic Tape Units can be connected to a 624-401 Control Unit. Controllers equipped with the 0624-0001 Dual-Model feature can be used to control 7-track NCR 634-107 Magnetic Tape Units recorded with the NRZI recording technique as well as the 635 Magnetic Tape Units. Features available with the Model 635 drives include automatic tape reel latching and automatic tape threading. Two models are available:

● 635-109: 9 tracks; 1600 bytes per inch (phase encoded)/800 bytes/inch (NRZI); 160,000/80,000 bytes/sec. Forward tape speed is 100 ips; rewind speed is 480 ips.

● 635-209: 9 tracks; 1600 bytes/inch (phase encoded)/800 bytes/inch (NRZI); 320,000/160,000 bytes/sec. Forward tape speed is 200 ips; rewind speed is 640 ips.

680-201 CARD READER: Reads 80-column cards serially at 1200 cards per minute. Has one input hopper and one output stacker with capacities of 4,000 cards each. A reject stacker with a capacity of 240 cards is also provided. Does not require a controller.

682-100 INTEGRATED CARD READER: Integral part of the Century 50 through 201 Basic Systems. Reads standard 80-column cards at a peak rate of 300 cards per minute. Cards are read in serial, column-by-column fashion by 12 photo-electric cells. Cards punched in Hollerith code (Extended A or H set) are translated into the internal (ASCII) code by a combination of hardware and software techniques. Has a 1000-card input hopper ▶

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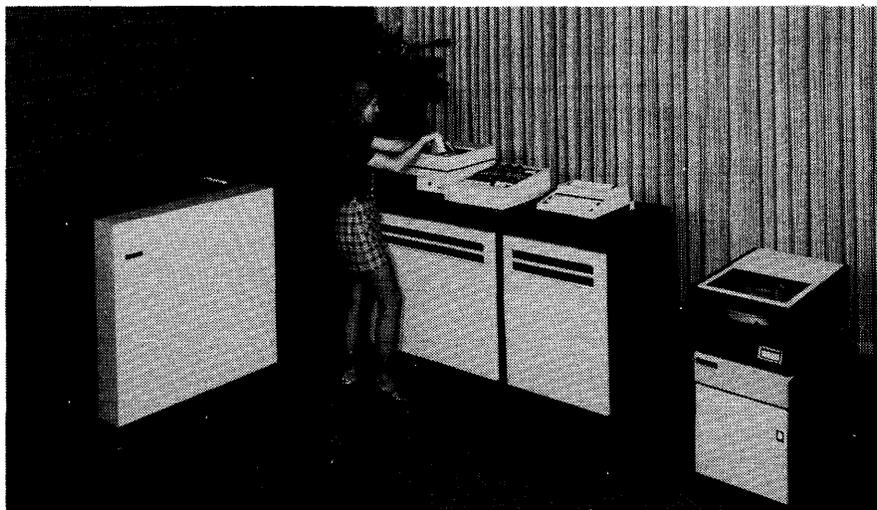
One of the two May 1974 additions to the NCR Century Series computer family, the compact Century 151 is the first to utilize MOS main memory. The Basic System pictured here features 32K bytes of 750-nanosecond MOS memory, an integrated 300-lpm line printer and 300-cpm card reader, and 9.8 million bytes of disc storage.

▷ **COMPATIBILITY**

Compatibility between the Century computers and other currently popular systems is limited. IBM-compatible tape units and an 8-bit byte data format are used, but the internal code is ASCII rather than EBCDIC, and System/360 and 370 compatibility has also been ignored in both the processor instruction repertoire and the removable disc packs. Optional compatibility features enable a Century 200 or 201 to execute machine-language programs written for the second-generation NCR 315 or IBM 1401 computers.

NCR has maintained full upward compatibility within the Century Series. The Century 50 and 100 Processors have a "stripped-down" repertoire of just 19 instructions. The Century 101, about 2.5 times as fast as the 100, and the Century 151, about 3.5 times as fast as the 100, have 34 standard instructions plus 3 optional instructions. This repertoire is essentially that of the Century 200 except for the 200's NCR 315 and IBM 1401 emulation instructions and certain commands used heavily in multiprogramming. Both the Century 200 and 201, which are about 5 times as fast internally as the 100, have 39 standard instructions, with additional instructions for NCR 315 and IBM 1401 emulation, floating-point arithmetic, decimal arithmetic, and multiprogramming available through field-installable optional features.

The Century 251, with approximately three times the processing power of the Century 200, and the Century 300, about five times as fast as the 200, have 71 standard instructions, including all those available for the smaller processors except instructions associated with the optional NCR 315 and IBM 1401 series compatibility. Thus, except for IBM 1401 emulation, which is available only for the Century 200 and its successor, the Century 201, and NCR 315 emulation, which is available on the Century 200, 201, 251, and 300 systems, NCR stresses that all hardware differences between the various processors are resolved by standard software, so that users can easily move up from the small-scale Century 50 to the large-scale 300 without reprogramming. ▷

▶ The Century 251 system has two high-speed trunks, with 4 positions each for free-standing peripherals or controllers, and one 8-position multiplexer trunk as standard. Three positions are reserved for the interval timer, I/O writer, and CRT display system; the other five positions can be used for free-standing peripherals or controllers. Four additional 8-position standard trunks are also available for the Century 251.

On the Century 300, six high-speed trunks, with 4 positions each for free-standing peripherals and/or controllers, and one 8-position multiplexer trunk are standard. Three of the multiplexer positions are reserved for the interval timer, I/O writer, and CRT display system; the other five positions can be used for free-standing peripherals and/or controllers. Four optional 8-position "very high-speed trunks" are also available for the Century 300.

SIMULTANEOUS I/O OPERATIONS: A maximum of two I/O operations can occur concurrently with computing in a Century 50 or Century 100 system. The Century 101 can perform up to eight I/O operations on four trunks simultaneously with computing due to a greater system bandwidth and the multiplexer channel. The basic Century 151 can perform five low-speed I/O operations on the multiplexer trunk and one high-speed I/O operation concurrently with processing; addition of the optional slow-speed and high-speed trunks allows a total of eight I/O operations to be performed concurrently with processing.

The Century 200 can perform four or eight I/O operations concurrently with processing (i.e., one operation per I/O channel). The Century 201 can perform up to eight operations (one on each I/O channel) up to the maximum system I/O bandwidth of 1700KB.

In the Century 251, one I/O operation can occur on each of the eight subchannels of the multiplexer trunk and on one position on each of the high-speed trunks concurrently with computing, resulting in 14-way I/O simultaneity. Also, with two-way memory interleave, the I/O Control Unit and the Arithmetic Logic Unit of the Century 251 Processor can access main storage simultaneously.

On the Century 300, one I/O operation can occur on each of the 6 high-speed trunks, on each of the 8 subchannels of the multiplexer trunk, and on each of the 4 very high-speed trunks (if installed) concurrently with computing, resulting in 18-way I/O simultaneity. Also, the Input/Output Control Unit and the Instruction Look-Ahead and Execution Units of the Century 300 Processor can all access main storage simultaneously.

I/O DATA RATES: See table.

I/O INTERFERENCE: Due to the "cycle-stealing" technique used in the Century Series, the Century 50 or 100 ▶

SOFTWARE

All software for the Century computers is disc-oriented and highly integrated. The principal software facilities include four levels of operating systems: the B1 Basic Executive for single-stream batch processing, the dual-partition B2 On-Line Operating Executive, the B3 Multiprogramming Executive, and the more powerful B4 Multiprogramming Executive (for Century 251 and 300 systems only). Recent enhancements to the operating system software have been aimed primarily at improving the systems' communications processing facilities and extending the multiprogramming capabilities of the B3 Executive. These include a Roll In-Roll Out feature for the B1 and B2 operating systems for handling inquiry processing, on-line communications drivers for handling communications networks (including a specialized module for interfacing NCR's wide variety of banking and retail terminals), and input spooling and more flexible memory management facilities to improve the B3 operating system's multiprogramming performance.

NCR also provides compilers for the COBOL, FORTRAN, and RPG languages and its own NEAT/3 language, an assortment of utilities, and an impressive selection of business-oriented applications programs. COBOL and FORTRAN compilers are offered at three different levels, tailored for operation on different equipment configurations. Also provided is a conversational-mode compiler for the BASIC language, available for the Century 50 (with an optional hardware support package) and all of the larger processor models.

NEAT/3 is a combination of COBOL and symbolic assembly language that places an unusually strong emphasis upon the use of macro-instructions to facilitate coding. NCR is encouraging Century users who are first-time computer users to program exclusively in the "Level 1" version of NEAT/3. At this level, all coding consists of macro-instructions and pre-coded "Major Functions." Thus, the programmer does not need to concern himself with machine instructions or other hardware details. NCR states that most Century 50 users select NEAT/3, Level 1 as their principal programming language. For more advanced programmers, higher-level versions of NEAT/3 permit full utilization of all the Century hardware facilities.

SUPPORT AND PRICING

Customer support for the Century Series computers is focused on several Regional Systems Centers. These facilities are staffed by specialists in the major fields serviced by NCR. The centers also provide training courses for customer personnel, facilities for customer backup, and computers on which customers can compile and test their programs before their own systems are delivered.

NCR's pricing structure can best be described as containing a "basic bundle." Under the plan announced in September 1969, NCR supplies certain essential and predetermined systems support and educational assistance along with the hardware. Once the basic allotments have been exceeded, any additional NCR support services that may be needed are separately priced. Most software is supplied without extra charge. ▷

processor is delayed for an average of 4.8 microseconds for every byte transferred to or from main storage. The Century 101 has an I/O interference of 2.4 to 6.0 microseconds per byte, depending upon the data rate of the I/O channel. The Century 151, with its faster main memory speed, incurs a delay of from 1.1 to 4.2 microseconds per byte, depending on the I/O channel.

The Century 200 is delayed 3.0 or 1.1 microseconds per byte for I/O operations on the standard or high-speed channels, respectively. The Century 201 is delayed 3.0 microseconds per byte for operations on low-speed channels, 1.1 microseconds per byte for high-speed channel operations, and 0.55 microsecond per byte for operation on the very high speed channel.

On the Century 251, due largely to the 2-way memory interleaving, the maximum system I/O data rate of 2.74 million bytes/second can be maintained with a minimal central processor I/O degradation.

On the Century 300, due largely to the 4-way memory interleaving, the maximum system I/O data rate of 4.3 million bytes/second can be maintained with a central processor I/O degradation of 0 to 150 nanoseconds per byte.

MASS STORAGE

655 SERIES DUAL-SPINDLE DISC UNITS: One of NCR's unique 655 series disc units is included in each Century 50 through 200 Basic System, and a second unit can be added to a Century 50 or 100 without adding a separate controller. Each unit has two independent spindles, and each spindle is capable of driving a removable disc pack. The 3-disc NCR 955-1 disc pack stores up to 4,194,304 bytes (or 8,388,608 packed decimal digits) in 512-byte sectors, with 8 sectors per track. Each spindle has a comb-like access mechanism with 12 read/write heads servicing each of the 6 recording surfaces. Up to 262,144 bytes per pack can be read without head movement (524,288 bytes per dual-spindle unit).

Types 655-151 (basic unit for Century 50 only) and 655-152 (optional second unit for Century 50 only) have an average head movement time of 131 milliseconds, while Types 655-101 (basic unit for Century 100 only) and 655-102 (second unit for Century 50 or 100) have an average head movement time of 44.7 milliseconds. All four dual-spindle models have an average rotational delay of 20.8 milliseconds and a data transfer rate of 108,000 bytes/second. All four models are for "integrated" attachment to the Century 50 or 100, respectively, and do not require controllers.

The 655-201 Dual-Spindle Disc Unit is similar to the 655-101 or 655-102 except that it is a "free-standing" unit that is used with the 625-101 Disc Controller. Up to four 655-201 units (or up to eight spindles) can be attached to each controller. The same 955-1 disc pack is used with the 655-201 unit. The 655-201 is part of the Century 200 Basic System.

656-102 DUAL-SPINDLE DISC UNIT: One Model 656 Disc Subsystem is included in each Century 101 and 151 Basic System, and includes a 6561 Disc Unit Controller, a 656-102 Disc Unit, and a 6562 Fixed Disc. Each Disc Unit has a capacity of 4.9 million bytes, an average access time of 35 milliseconds, an average rotational delay of 12.5 milliseconds, and a data transfer rate of 312,500 bytes per second. The 6563 Dual Disc Attachment permits the addition of a second unit, which can include one or two additional 4.9-million-byte disc units, one of which is removable.

657-101/102 DISC SUBSYSTEM: Provides medium-capacity random-access storage in removable 11-high disc packs. Each NCR 957-1 disc pack stores up to 29.8 million bytes of data in standard-density format or up to 47.7 million bytes in "double-density" format. The 957-1 pack is physically compatible with the IBM 2316 pack, although the recording formats differ. Each spindle holds one disc pack and has a comb-like access mechanism with one read/write head serving each of the 20 recording surfaces. Average head movement time is 60 milliseconds and average rotational delay is 12.5 milliseconds. Capacity ▶

NCR Century Series

> cited favorably for easy-to-use job control language, ease of programming, and operator-oriented operating system design.

Some complaints were registered about peripheral reliability, in particular the Model 655 Disc Drives, but the newer Model 657 Disc Drives were described as better performers. Users also expressed a need for more technical support for their software.

There were two other categories in which these NCR Century Series users expressed high levels of satisfaction that were not so evident from the numerical ratings. One is the high degree of compatibility within the Century family. The most successful conversions were upgrades within the Century Series product line. To quote one user, "Upgrade conversions are no more than removal of the old and plugging in the new system." Another respondent described the complete interchangeability of software between a Century 201 and Century 151 in his installation as a principal advantage of the product line. The other performance category, which isn't specifically rated in Datapro's survey form but was cited most often by these respondents as a major advantage of the Century Series equipment, is cost/performance. The systems' capabilities to meet the overall processing requirements of their users at very attractive prices was described by many users as a major source of their satisfaction with the NCR Century Series.□

► STAGE I COBOL: Usable on a basic 16K Century 50 or larger, the Stage I language is a restricted but useful subset of ANS COBOL. Stage I COBOL is upward-compatible with NCR's own Stage II and III COBOL implementations and with any ANS COBOL compiler. The language includes selected elements from the Nucleus, Sequential Access, Random Access, Table Handling, Segmentation, and Library modules of ANS COBOL; the Sort and Report Writer modules are not implemented. Within the Nucleus module, the COMPUTE and EXAMINE statements are not implemented and there are limitations upon the ADD, ALTER, GO TO, MOVE, PERFORM, and SUBTRACT statements. Subscripting and indexing are limited to a single level. Compilation speed, according to NCR, is about 50 or 100 statements per minute on a 16K of 32K Century 100, respectively.

STAGE II COBOL: Usable on any 32K or larger Century system, the Stage II language consists of the following ANS COBOL modules: high-level Nucleus, Random Access, and Sequential Access; medium-level Table Handling; and low-level Segmentation and Library. Compilation speed, according to NCR, is about 100, 200, or 500 statements per minute on a Century 200 with 32K, 65K, or 262K bytes, respectively.

STAGE III COBOL: Released in September 1973 for use on Century 200 and larger systems with at least 64K bytes of main memory, the Stage III COBOL language is stated to be a complete, high-level implementation of ANS COBOL, including the Sort and Report Writer modules.

BASIC: A compiler for BASIC, an algebraic language designed for time-sharing computers, can be used on Century 200 and larger systems. Programs are compiled as they are entered from remote teletypewriters and can be executed immediately. Diagnostic messages permit on-the-spot correction of many errors. An accounting routine facilitates billing by recording the amount of computing time used by each programmer at each terminal.

NCR announced the BASIC-I Programming Language for use with Century 100 systems in April 1971 and for the Century 151 in May 1974. The package is separately priced and available in two versions, for dedicated and "dual" (shared-use) systems. The dedicated version can be used on a 16K Century 50 and accommodates up to 10 data terminals. The dual system requires a 32K Century 50, supports up to 10 terminals, and allows concurrent background processing. The BASIC-I language is a subset that is upward-compatible with the BASIC compiler for the Century 200 and larger computers.

FORTRAN: Four different FORTRAN compilers are offered as described below.

CENTURY BASIC FORTRAN: Usable on a basic 16K Century 100 or larger computer under the B1 or B2 operating system, NCR Basic FORTRAN is based on the ANS Basic FORTRAN standards and also includes the following extensions: 1) longer statement labels; 2) an unlimited number of characters allowed in symbolic names; 3) an unlimited number of array dimensions; 4) an expanded character set; 5) additional I/O format capabilities; and 6) mixed-mode arithmetic. The FORTRAN compiler can operate in either the compile and run or compile, load, and go mode to permit execution immediately after compilation.

CENTURY INTERMEDIATE FORTRAN: Usable on a 32K Century 100 or larger, this version includes all of Century Basic FORTRAN plus a number of additional extensions, and is compatible with the "Basic FORTRAN IV" language for the IBM 1130. The 32K version includes tracing and error-checking functions, random disc access, sense light routines, and four additional statements: DATA, EXTERNAL, DEFINE FILE, and Data Type (INTEGER, REAL, DOUBLE PRECISION, COMPLEX, or LOGICAL).

CENTURY FULL ANS FORTRAN IV: Usable on a 32K Century 101 or larger, this full implementation of ANS FORTRAN also includes the following extensions: mixed-mode arithmetic, an unlimited number of dimensions in an array, random READ and WRITE statements, and extensions to the CALL statement.

CENTURY FORTRAN E: Usable on a Century 101 or larger processor with a minimum of 48K bytes of memory and the Logic hardware option, the FORTRAN E compiler incorporates the features of Full FORTRAN, above, with the exception of random I/O. The compiler is designed for use in educational environments and features fast compilation, immediate execution of programs, and comprehensive error statements. Execution speeds of FORTRAN E programs are slower than those produced by the Intermediate or Full FORTRAN compilers, however, and there are no facilities for saving FORTRAN E object programs.

ASSEMBLER: NEAT/3 is NCR's version of an assembler language for the Century Series. Strong emphasis is placed upon the use of macro-instructions and "Major Functions" to facilitate coding. Major Functions are pre-coded routines to perform common data processing functions such as Accumulate, Collate, and Master File Update; the programmer fills out a questionnaire to tailor these routines to his needs. The disc-oriented NEAT/3 Compiler is usable on all Century systems.

NEAT/3 Level 1 is a subset of NEAT/3 that provides an easy-to-learn programming language and faster compilation.

RPG: A bundled RPG compiler is available for use on Century 50 through 200 systems with a minimum of 16K bytes of main memory, dual disc units, a printer, and a card reader. Use of indexed sequential file processing raises the main memory requirement to 32K bytes.

NCR 315/RMC TRANSLATOR: Translates programs written in NEAT assembly language for the NCR 315/RMC computer into NEAT/3 source statements for the Century 251 and 300. The translator itself runs on the 315/RMC. Input is from punched cards, and output is on either cards or magnetic tape, together with a printed listing. Source statements that cannot be automatically translated are flagged on the listing for manual recording. ►

NCR Century Series

With about twice the internal performance of the Century 200, the Century 251 neatly plugs the sizeable performance gap that previously existed between the 200 and the top-of-the-line Century 300. Shown here is a large Century 251 installation with both disc and magnetic tape capabilities.
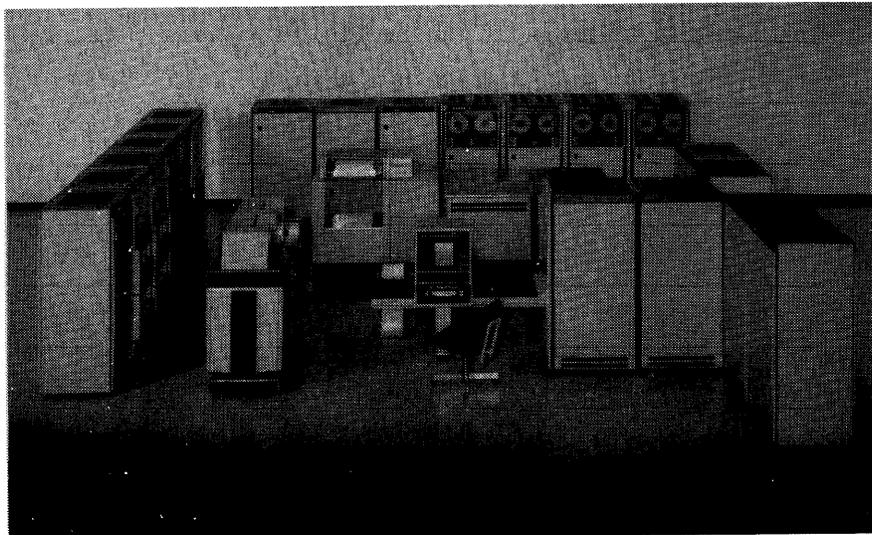
► **UTILITY ROUTINES:** In addition to a Generalized Sort Routine, NCR provides a Tag Sort and a Large Memory Sort (for Century 101 and larger systems) that expands to utilize more than 64K bytes of memory for more efficient processing. There is also a complement of utility routines to handle file creation, library maintenance (SPUR and OPUR), data transcription, overlay control (OMPA), disc file management, and memory dumps. A Symbolic Debug Routine is provided to facilitate debugging of COBOL and NEAT/3 programs. The recently released Propagate Utilities routine can be used to copy selected software routines from a source disc pack to up to 12 destination disc packs to assist users in implementing new versions of utility programs.

APPLICATION PROGRAMS: NCR offers "packaged" programs to handle key applications in manufacturing, food processing, wholesale distribution, retailing, schools, financial institutions, hospitals, and local government.

Among the application programs available to users of the Century 50 and larger systems at no extra charge are:

> Retail Accounts Receivable
> Accounts Payable
> Payroll and Personnel Management
> Medical Audit Statistics System (Mass)
> Hospital Accounts Receivable
> Hospital Clinical Analysis
> Inpatient Accounting
> Post-Discharge Accounts Receivable
> Order Entry
> Stewardship and Management Accounting
> Student Scheduling and Grade Reporting
> Student Test Analysis
> Requirements Planning
> Production Scheduling
> Emphasis
> Utility Billing
> Department Store Sales Audit
> General Reporting System
> Project Network Analysis (PNA)
> Basic Estimating Technique (BETS)
> Fashion Reporting
> Stable Stock Replenishment
> CIF-DDA Bank System
> Linear Programming

Application packages available to users of the Century 100 and larger systems at no extra charge include:

> General Accounts Payable
> Law Enforcement Control System
> Building Contractors System
> Statistical Analysis
> Personal Trust Accounting
> Dedicated Commercial Bank Inquiry System
> Material Requirements Planning

Packages available to users of the Century 200 and larger systems at no extra charge include:

> Local Government Administration System
> Bill of Materials Processor
> Manufacturing Inventory Control System

Separately priced NCR software includes (at charges based upon the "value and uniqueness" of each package): A Personal Trust Accounting System for Century 100 or larger systems with at least 32K bytes of main memory ($20,000 license fee plus $5,000 one-time installation fee plus expenses and $500 for each 1,000 trust accounts); COSMOS I for supermarket inventory control (at a price based upon the size of the inventory application); Law Enforcement Case Accounting System (with three modules costing $195 each); School Automated Records System (SCHOLARS), consisting of five modules with a total monthly license fee of $80 each, an $850 annual license fee each, or a $12,500 one-time fully-paid license fee; Medical Information and Communications System (MEDICS), with an installation fee of $27,000 plus a monthly license fee of $630 per month on a five-year agreement or a one-time payment of $33,000; a linear-programming Feed Information System, with a one-time license fee of $7,500 or a monthly fee of $225, plus a $50 per month usage fee to receive new releases; and the Financial On-Line Central Information System (an enhancement of the Central Information File (CIF) System), which has a monthly license fee of $100, an annual license fee of $1,200, and a one-time fully-paid license fee of $4,000.

PRICING

In December 1975, NCR announced selected increases in maintenance and rental prices for Century Series processors and associated peripherals. Purchase prices remained the same for all equipment in the Century Series product line. Monthly rental rates were increased by 0.5 to 2.5 percent for Century Series central processors with the exception of the Century 151, 251, and 300 processors, which were unchanged. Rental rates for Century Series peripherals were increased by 1 percent, except for the Model 657 and 658 Disc Subsystems, the Model 636 Magnetic Tape Cassette Reader, Century Series communications equipment, and central processor features, all of which also remained unchanged. Maintenance rates for purchased central processors were increased by from 1 to 10 percent, excluding the Century 151, 251, and 300 computers, and were increased by an average of 8.5 percent for purchased peripheral equipment, excluding the Model 657 and 658 Disc Subsystem, the Model 636 Magnetic Tape Cassette Reader, Century Series communications equipment, and central processor features. ►

NCR Century Series

▷ ence to the more flexible (but often slower) microprogramming control techniques employed in many other contemporary computers. An optional emulator for the older NCR 315 and 315 RMC computers is available for the Century 251 and 300.

The Century 300 can use essentially all of the peripheral equipment available for the Century 100 or larger, plus a number of other high-speed devices. The flexibility of the Century 300 hardware is somewhat limited, however, by the fact that no dual-channel peripheral controllers have been announced to date.

Perhaps because of the dramatic increase in processing power that the Century 300 offered over the Century 200 in the original product line-up of 1970, the Century 300 got off to a relatively slow start. That extremely large price/performance gap was filled by the NCR 251 in 1973. Then, on April 1, 1974, NCR reduced the rental and purchase prices for Century 300 basic systems by 5% and drastically reduced the price of main memory increments. Rental and purchase price reductions ranged from 30% for a 256K Century 300 Processor to 44% for a 512K Century 300 Processor. In addition, Century 300 users—as well as Century 251 users—have unlimited use of their systems for the basic rental price, a definite asset for on-line system users.

NEW BASIC SYSTEMS

In August 1975, immediately after the announcement of the availability of the Model 657 Dual-Density Disc Units for the smaller Century 101 and 151 processors, NCR released a new series of basic configurations for Century 101 through 251 packaged systems that permit these systems to be equipped with the higher-performance 657 Disc Units in place of the original Model 655 and 656 Disc Units. The new basic systems are distinguished from the earlier basic systems with an "X" and include the original complement of peripherals except for disc drives. Purchase and one-, three-, and five-year rental prices for the "X" Basic systems are substantially lower than the earlier basic system prices, and new three- and five-year rental prices were also released for the Model 657 Disc Units. As a result, a Century 101 configuration including 16K bytes of main memory, 300-lpm printer, 300-cpm card reader, and 120 million bytes of direct-access storage can now be rented for $3,505 per month on a five-year lease, as compared to $1,970 per month for the original Century 101 basic system with only 9.8 million bytes of direct-access storage.

In summary, the NCR Century Series shapes up as a mature third-generation system that has been kept up-to-date in price and performance through a succession of new processor models, hardware and software enhancements, and significant price reductions. The upward compatibility of these systems over a wide range of computational capability, plus NCR's commitment to supply both specialized software and data entry devices to meet the needs of targeted industry sectors, should continue to make them strong contenders for users with small-to-medium-scale computing requirements.   ▷

▶ The Monitor is called into main memory at the start of each day and at the end of each program. It controls the sequencing, linking, and loading of programs. It can run a series of programs as directed by a control string entered via punched cards, punched tape, or the console keyboard. The Monitor provides calendar and date-controlled protection of files and calendar-controlled scheduling and modification of programs. The I/O Executive is divided into a memory-resident portion and a disc-resident portion. The memory-resident portion occupies about 4000 bytes of main memory and handles all I/O operations, error conditions, program overlays, and subroutine calls. The disc-resident routines are called into main memory when needed to deal with less frequent situations such as open and closing of files, retries of I/O operations that failed, etc.

The Disc Management routines are used primarily to ensure that the system discs always contain accurate, up-to-date versions of the NCR software. The Log routines maintain a system disc log of status information such as hardware malfunctions and incorrect operating procedures. The Display routines provide communication links between the operator and either the programmer or the operating system.

The Resident Sector Management-100 (RSM-100) software subroutine permits software and program overlays to be pooled in main memory to reduce the number of disc accesses required for overlays during program execution. RSM-100 is available for Century 50 and 100 systems with a minimum of 16K bytes of main memory and at least 4096 bytes to accommodate program overlays. As software and program overlays are required during program execution, the RSM-100 routine determines whether the overlay is currently in the overlay pack area and moves a copy of the overlay to the user program area or a software overlay work area. If the desired overlay is not present in the pool, a disc access is required to call the overlay from disc.

A Roll-In/Roll-Out capability, available under the B-1 Executive for Century 50 and larger processors with a minimum of 16K bytes of main memory, handles limited inquiry processing from teletypewriter-compatible terminals. Upon receiving a request for service from a terminal, Roll-In/Roll-Out places a snapshot of the currently-executing batch program on disc, processes all terminal requests for service and automatically resumes batch processing from the point of interruption.

ON-LINE OPERATING EXECUTIVE (B2): Usable on all Century systems with at least 32K bytes of main storage, this operating system divides main memory into two distinct areas which can be used for processing either two concurrent batch programs or one communications program plus one background batch program. A Dynamic Storage allocation feature allows memory for servicing terminals to be allocated as a central pool. The Resident Sector Management feature allows the operating system to map program and software overlays into unassigned areas of memory.

The Queue Executive Interface (QXI), released for the B2 dual-program executive in August 1975, includes on-line communications drivers for handling teletypewriter-compatible terminals or networks including both teletypewriter-compatible terminals and the NCR 796-301 Visual Display Terminals. QXI can be used with a Century 101 or larger computer with a minimum of 32K bytes of memory. A specialized Financial/Retail On-Line Communications Driver is also available for handling communications networks configured with the specialized NCR banking and retail terminals.

The B2 system was delivered late in 1969. Its resident portion occupies about 9K to 12K bytes of main storage.

MULTIPROGRAMMING EXECUTIVE (B3): Usable on Century systems with at least 64K bytes and the Multiprogramming Feature, this operating system divides main memory into two or more partitions of at least 16K bytes each. Each partition has its own set of 63 index registers and, in the original B3 release, its own disc unit ▶

▷ **USER REACTION**

The NCR Century Series was represented by 71 responses reporting on 75 computer systems in Datapro's 1975 survey of users of general-purpose computer systems. In terms of specific computer systems represented in these responses, 2 were Century 50 systems, 4 were Century 100's, 16 were Century 101's, 4 were Century 151's, 24 were Century 200's, 7 were Century 251's, and 3 were Century 300's.

The average length of time in use for all of these Century systems was 30 months, with the Century 50 and 100 leading the others in length of service with an average of 44 months, and the Century 251 and 300 representing the newest installations with an average of 11 months of service.

The overwhelming majority of these systems—93 percent—were performing business data processing, while 10 percent were engaged in scientific/engineering applications and 17 percent were described as performing data base management functions. Eighteen percent of these Century Series users reported that their systems were also performing data communications processing.

Seventy-seven percent of the respondents said that their systems were on rental from NCR, 18 percent listed their systems as purchased, and 6 percent said they had obtained their systems through a third-party leasing arrangement.

Fifty-six of the users stated that the currently installed Century Series equipment replaced an earlier computer system, 46 (or 80 percent) of which were also NCR systems.

Here's how these Century Series users rated their systems in the 1975 Datapro survey:

	Excellent	Good	Fair	Poor	WA
Ease of operation	29	33	7	2	3.3
Reliability of mainframe	38	31	2	0	3.5
Reliability of peripherals	20	39	7	3	3.0
Maintenance service:					
Responsiveness	35	28	5	2	3.3
Effectiveness	30	28	11	5	3.2
Technical support	9	19	30	9	2.4
Operating systems	16	40	10	3	3.0
Compilers and assemblers	13	37	15	4	2.9
Applications programs	8	27	21	4	2.7
Ease of programming	18	40	9	2	3.1
Ease of conversion	23	28	12	2	3.1
Overall satisfaction	19	43	5	6	3.2

*Weighted Average on a scale of 4.0 for Excellent.

In the results of this survey, the Century Series processors earned their highest marks for mainframe reliability, ease of operation, and maintenance service. The users' high regard for the stability and reliability of the NCR equipment and software was also expressed in their responses to our question about the principal strengths of the system; users mentioned such factors as "solid hardware and operating system," "reliable hardware," and "overall reliability of total system" as major strengths. The Century Series systems were also ▷

▶ and its own job stream so that its operations were largely independent of other partitions. The B3 system was delivered late in 1969.

Principal extensions added to the B3 operating system after its initial release include resource-sharing features such as: 1) the use of a single system disk unit, shared by all active programs, rather than a separate disk unit for each partition; 2) the capability for programs running in different partitions to access a shared disc unit; 3) a Common Program Library Disc that permits programs in several partitions to store programs, utility routines, and user routines on a single disk unit; and 4) a Peripheral Reassignment feature that permits the operator to reassign peripherals among partitions without interrupting operation of the system. The extended B3 operating system also supports operator communications via a CRT display unit in Century 251 and 300 systems and spooling of printer output to disc for eventual printing.

A new version of B3 released in July 1974 included the following major extensions: 1) the use of a common disc unit for the Common Program Library and the Common System Disc; 2) software overlay pooling; and 3) operator-initiated dynamic allocation of memory between two partitions. Further enhancements added to the B3 system in August 1975 included card input spooling, common disk backup for software overlays to facilitate recovery from a read error, dynamic assignment of partition priorities, and operator-controlled job scheduling. The latest release of the B3 operating system also provides facilities for automatic propagation of utility routines from a master disc pack.

One or more user partitions in a B3 system can contain an on-line program running under the B2 executive. The B3 operating system is usable on Century 101, 151, 200, 201, 251, and 300 systems and requires approximately 16K bytes of main memory for residence of the executive.

MULTIPROGRAMMING EXECUTIVE (B4): A still more powerful operating system, called B4, can support up to nine concurrent jobs, limited by system resources. B4 has been operational on the Century 300 since March 1972. Among the B4 extensions beyond the earlier Century operating systems are: 1) automatic job scheduling according to job priorities; 2) dynamic memory allocation under software; 3) dynamic allocation of peripherals based on job priorities; 4) expanded operator communication facilities, with system status displays organized in a hierarchical structure; 5) facilities for inter-job communication among active programs; 6) remote job entry facilities; 7) checkpoint and restart facilities to aid in the recovery from system failures; and 8) job cataloging and job accounting capabilities.

Additional enhancements added to the B4 operating system in August 1975 include printer spooling to magnetic tape, data compaction of spooled printer files, and remote job entry from an IBM 2780-type remote terminal (or a Century computer simulating a 2780 terminal) or from an IBM HASP (or equivalent) multi-leaving terminal.

B4 makes extensive use of overlays and has a minimum practical resident main memory requirement of 64K bytes; additional memory up to a total of about 100K bytes is utilized if available. B4 is the primary operating system for Century 251 and 300 computers.

TOTAL: This popular data base management system, developed and marketed by Cincom Systems, Inc., is available for use on Century 251 and 300 systems. The software is marketed and supported by Cincom Systems for these NCR computers and has a license fee of $30,000 per single processor installation and a yearly maintenance charge of $1,500 after the first year. TOTAL is described in detail in Report 70E-132-01.

COBOL: Three different COBOL compilers are available, as described below. All use source languages based on ANS COBOL. ▶

NCR Century Series

▷ with only 32K bytes of main memory and considerably less disc storage, begin at a lower price tag than the more powerful Century 201 basic system, which offers twice the amount of main memory and ten times the amount of disc storage. Main memory increments, however, are priced to make the Century 201 pricing more attractive as the main memory sizes are increased. As a result, a Century 201 basic system including a processor with 512K bytes of main storage has approximately the same rental price as a Century 200 basic system with a 512K central processor.

To further enhance the Century 201's posture in multiprogramming environments, NCR has halved the price of the optional Multiprogramming Feature.

Current Century 200 users can upgrade to a Century 201 configuration by purchasing a Century 200/201 Upgrade Kit for a one-time charge of $15,750, and adding the necessary features, such as 650 nanosecond memory, the octaplex I/O system, and larger discs, that transform the Century 200 to a minimum Century 201 configuration.

Software support for the Century 201 includes the Basic Executive, On-Line Operating System Executive, and B3 Multiprogramming Executive operating system levels, Stage III COBOL, all available NCR FORTRAN compilers, RPG, BASIC, and NEAT/3.

THE CENTURY 251

Introduced in January 1973 as the sixth member of NCR's Century Series line of computers, the Century 251 has a little more than three times the processing power of the Century 200 and 201 and slightly more than one-half the power of the Century 300 processor. When it was originally announced, the 251 offered users with requirements of 96K to 256K bytes of main memory a much more powerful processor with greater I/O configuration capability at a purchase price only 10 to 25% higher or a rental price about 2 to 25% higher than the Century 200, depending upon memory size and length of lease contract.

With the advent of the Century 201, NCR performed some restructuring of the 251 system, including expanding the allowable main memory capacity to 524,288 bytes and announcing a new basic configuration, similar to those available with smaller Century Series processor models with one-, three-, and five-year lease terms. The packaged Century 251 system includes a 192K-byte processor with a Time-of-Day Clock, two Model 657-102 Dual-Spindle Disc Units (192 million bytes), 1500-lpm printer, and 300-cpm card reader and rents for $12,465 or $10,645 on a one-year or five-year lease, respectively. Purchase price is $490,090. Thus, a more powerful Century 251 system with three times the main memory and nearly twice the on-line mass storage capacity rents for approximately twice the price of the Century 201 basic system. However, Century 251 memory increments are progressively less expensive for larger capacities, so that the rental for a Century 201 basic system with 512K bytes of main storage is only some 20% less than for the Century 251 packaged system with 512K bytes.

In essence, the Century 251 is a lower-cost, lower-performance version of the Century 300, with full field-upgrade potential to a complete Century 300 system. ▷

The 420 readers are connected to the common trunk through the 622-301 OCR Control Unit.

670-101 MICR SORTER/READER: Reads MICR-encoded documents of intermixed sizes, thicknesses, and paper weights at up to 600 documents per minute. Has 11 pockets capable of holding up to 225 items each. Also usable for off-line sorting. Consists of a 622-401 Controller and a 404-111 Sorter. Available for the Century 50 as well as for the larger models.

671-101 MICR SORTER/READER: Reads MICR-encoded documents at up to 1200 per minute. Has 18 pockets. An endorser feature is available as an option. Also usable for off-line sorting. Not available for the Century 50 or 100. Includes a controller.

736 DATA RECORDERS: These keyboard-to-tape recorders, manufactured by Mohawk Data Sciences, can be connected on-line with the 622-201 Controller or 621-101 Controller with associated adapter to provide low-speed magnetic tape input (at up to 1500 char/sec) and output (at up to 700 char/sec.) Available for the Century 50 as well as for the larger models.

636-201/301 CASSETTE HANDLER: Attaches to a common I/O trunk on a Century 50 or larger system and provides file compatibility between Century Series processors and the NCR 399 Accounting Systems and NCR terminal units that use magnetic tape cassettes as their recording medium. Standard NCR Century magnetic tape software is used to perform read and write operations under control of a Century Series computer, and Century Series magnetic tape utilities also can be used with the cassette units. The Model 626-201 consists of an integrated controller and two cassette handlers housed in a single cabinet, and the Model 636-301 consists of a controller and one or optionally two cassette handlers. Each cassette cartridge contains approximately 280 feet of tape with two parallel recording tracks, only one of which can be accessed at a time. The capacity of each track is 2040 80-character blocks or 984 256-character blocks. Recording density is 800 bits per inch in phase-encoded mode, tape speed is 7.5 inches per second, and data transfer rate is 750 characters per second.

COMMUNICATION CONTROL

6002 INTEGRATED COMMUNICATIONS ADAPTER (ICA): Handles up to 10 synchronous or asynchronous lines as an integrated unit on the Century 101 and 151 Processors.

621-101 COMMUNICATIONS CONTROLLER: Controls up to 15 lines, at transmission speeds of 45 to 50,000 bits/sec. Has a 16-position priority scanner and single-character buffer. Most I/O control functions must be performed by the Century 50 through 300 Processor. A variety of asynchronous communications adapters and interface devices are available. An adapter is required for each communication line handled. The 621-101 must be connected to a position on a low-speed trunk only.

621-103 COMMUNICATIONS MULTIPLEXOR: Capable of handling 16 or 256 lines, using ROM transmission/control character tables, centralized character parity assembly and stripping, plus centralized BCC, CRC, and function code control. A Hardware Assisted Software Queue (HASQ) feature is also available to help identify the terminals; this feature is standard with the 621-103 on the Century 300 and optional on all other Century systems. The 621-103 connects to the common trunk of any Century Series processor. A "bucket" operation capability is also available to permit the transmission of a record of indeterminate length through a hardware technique of using dual buffers. The 621-103 simultaneously handles both synchronous and asynchronous devices using various transmission codes and speeds. Asynchronous devices can operate at 16 speeds ranging from 45 to 2400 bits/sec, and synchronous devices at speeds ranging from 600 to 50,000 bits/sec.

796 VISUAL DISPLAY TERMINALS: The 796-101, -201, and -301 were announced in February 1974. Each ▶

▷ This upgrade is done through the installation of a Century 300 "Performance Package." The cost of this package is the difference in price between a comparably sized Century 300 and 251 mainframe. The design of the Century 251 processor and main memory is derived directly from that of the Century 300 processor. The 251 implements the full Century 300 instruction set, although its basic instruction execution times are generally about 10 to 15 percent slower than those of the 300. The core memory used in the 251, although fundamentally similar to that of the 300, has only 2-way interleaving instead of 4-way, but has the same 0.68-microsecond cycle time as the 300.

All peripherals, communication subsystems, and software operating systems available for the Century 300 can be used with the 251. However, the Century 251 cannot have the Very High Speed Trunks provided as options for the Century 300; only two standard trunks and an integrated multiplexer trunk are included in the "basic" system, with four additional trunks optional. The overall maximum I/O data transfer rate and the individual trunk transmission rates are slowed somewhat, but not enough to preclude attachment of the fastest NCR peripherals available today, including the Model 658 Disc Storage Subsystem.

THE CENTURY 300

The NCR Century 300 provides impressive hardware and software facilities for multiprogrammed batch processing of business and scientific applications. It is also an effective performer in real-time and data communications environments. Thus, the Century 300 shapes up not only as the logical choice for current users of the NCR 315/RMC or Century 251 computers who need more processing power, but also as a system that merits careful consideration by many companies shopping for a new medium-scale computer.

Monthly rentals for Century 300 systems begin at about $15,000, with most systems falling into the $20,000 to $25,000 range. The "basic" Century 300 package, unlike other basic Century systems, is not a complete configuration; it consists of the processor and main memory only. Among the major improvements offered by the Century 300 over the smaller NCR Century computers are the following:

● From 131K to 4096K bytes of core storage with a 680-nanosecond cycle time per 4-byte access.

● Four to 32 independently cycling core memory modules with 4-way interleaved addressing.

● Overlapped operation of two independent functional units—an Instruction Look-Ahead Unit and an Execution Unit—within the central processor.

● An Input/Output Control Unit capable of handling 18-way I/O simultaneity and a total data rate of up to 4.3 million bytes per second.

● A 16-level priority interrupt system.

● A standard Operator Communication Center that includes a CRT display, printer, keyboard, and control panel.

The Century 300 Processor uses monolithic integrated circuits of the same basic type used in the smaller Century systems. "Hard-wired" logic is used in prefer- ▷

▶ includes an 8-by-10-inch CRT display with a capacity of 1920 characters in 24 lines of 80 characters each, a typewriter keyboard, a 10-key numeric pad, and an optional NCR 260 Non-Impact Printer for hard copy output. The basic 796-101 display is teletypewriter-compatible and transmits in asynchronous mode, one character at a time, at a speed of 110 bits per second. The 796-201 Block/Conversational Terminal can transmit in the conversational (one character at a time), message, or page operational mode and has a maximum data transfer rate of 2400 bits per second. The 796-201 can also be equipped with an optional 11,520-element graphics matrix for preparation of charts and graphs and an integrated acoustic coupler for communication through a telephone handset. The 796-301 Pollable CRT Terminal operates in either page or message mode at transmission speeds of up to 9600 bits per second. The 796-401 Block/Conversational CRT Terminal was announced in November 1975 and features a selection switch for operation at 110, 300, 1200, 2400, or 9600 bits per second; the conversational, page, and message operational modes are supported, and the graphics and printer options are available.

692-600 ASYNCHRONOUS ADAPTER: Handles up to 16 transmission speeds ranging from 45 to 2400 bits/second, and permits attachment of popular NCR devices such as the 270 Financial Terminal, 260 General Purpose Terminal, and 399 Accounting Computer, as well as other non-NCR devices.

693-600 SYNCHRONOUS ADAPTER: Supports speeds from 600 to 50,000 bits/second for popular IBM binary synchronous (BSC) terminal devices or processor-to-processor communications. Operates under the B2 Software Executive and the BSC application package in IBM 2780 mode. For 16K systems, binary synchronous support is offered in a dedicated mode of operation only. With 32K bytes, a flexible, multitask communications capability is supported.

BINARY SYNCHRONOUS COMMUNICATIONS PACKAGE: This facility equips a Century 50 to act as a remote "satellite" system capable of communicating with a central Century 101 or larger computer via a single half-duplex or full-duplex line. Data is transmitted in binary synchronous (BSC) mode at a speed of 1800 to 4800 bits per second, using ASCII code. The package includes a multiplexer, a single-line synchronous adapter, and an adapter for the 6101 Input/output Writer, which is required for system operation in the communications mode. Supporting software enables the Century 50 to receive data from the central Century system and write it in disc storage, and to read data from disc storage or cards and transmit it to the central system. Software is also available to link the Century 50 to other manufacturers' computer systems.

BASIC-I HARDWARE PACKAGE: This feature equips a Century 50 system with the minimum on-line equipment required for use of NCR's BASIC-I Programming Language. It consists of a multiplexer and a single-line asynchronous adapter. The basic feature supports one remote data terminal; additional terminals can be supported by means of a 692-100 Asynchronous Adapter for each line.

SOFTWARE

OPERATING SYSTEMS: NCR provides four different levels of integrated, disc-resident operating systems for the Century Series computers. Each consists of a Monitor, an Executive, and several other routines. The Monitor controls the sequencing, loading, and linking of programs. The Executive is a run-time supervisor that handles all I/O operations, error conditions, and program overlays. The four levels can be summarized as follows:

BASIC EXECUTIVE (B1): All Century computers can use the basic B1 operating system. This system, delivered in November 1968 with the first Century 100 installations, handles batch-mode processing of one program at a time. The B1 system consists of a Monitor, an I/O Executive, Resident Sector Management subroutines, and Disc Management, Log, and Display routines. ▶

NCR Century Series

▷ have been eased considerably. All types of NCR peripherals—MICR, OCR, magnetic tape, punched card, paper tape, and data communications—can now be connected to the Century 50 in addition to the standard devices in the basic system. Currently, only the non-availability of the highest-speed, highest-performance Century 100 peripherals distinguishes a Century 50 from a larger Century Series computer system.

The Century 50 has plainly been designed and priced to compete effectively against the popular IBM System/3. The Century 50 Mod 1 is targeted directly at IBM's small-scale System/3 Model 6, while the larger Century 50 Basic configuration, which comes equipped with a faster printer and card-oriented I/O devices at a monthly rental of $1,460 on a five-year lease, is designed to compete with disc-oriented System/3 Model 10 systems. Since every Century 50 system includes disc storage, the Century 50 is not directly competitive with card-oriented System/3 configurations. Instead, NCR stresses the many advantages of batch-mode magnetic file processing with disc-based master files.

Some competitive advantages of the NCR Century 50 include full program compatibility with the larger members of the Century Series, no additional charges for Century 50 software, and a $1,000 training allowance for Century 50 customers.

On balance, the Century 50 shapes up as an appropriate choice for many companies that are installing their first computers or upgrading from punched cards to disc systems. By providing effective disc-oriented business data processing capabilities at a very reasonable price, the Century 50 neatly fills the gap that previously existed between NCR's electronic accounting machines and the larger Century Series computers.

THE CENTURY 100, 101, AND 200

The basic Century 100 system consists of a central processor with 16,384 bytes of rod memory, two I/O channels, one dual-spindle disc drive, a 450-lpm printer, and either a 300-cpm card reader or 1000-cps paper tape reader. The processor contains built-in controllers for the three standard peripheral units. The memory capacity can be increased to 32,768 bytes, and a wide range of peripheral equipment can be connected.

The Century 100 is no longer being manufactured.

The basic Century 101 system consists of a processor with 16,384 bytes of core memory, two I/O channels (one of which is a five position multiplexor channel), one dual-platter disc drive, a 300-lpm printer, and a 300-cpm card reader. The memory capacity can be expanded to 24K, 32K, 48K, 64K, 96K, or 128K bytes, two more I/O trunks can be added, and a wide range of peripheral equipment, including the NCR 657 Dual-Density Disc Unit, can be connected.

The basic Century 200 system consists of a processor with 32,768 bytes of rod memory, four I/O channels, a console typewriter, one dual-spindle disc drive, a 1500-lpm drum printer, and either a 300-cpm card reader or 1000-cps paper tape reader. A Century 200 can be expanded by adding up to 524,288 bytes of memory, ▷

▶ and a single 1000-card output stacker. Does not require a controller. The 682-100 is not available for the Century 300.

684-101/301 CARD READ/PUNCH: Reads 80-column cards serially at speeds of up to 500 cpm and punches column-by-column at 100 to 460 cpm, depending on the number of columns punched in each card. The Model 684-301 operates as a card punch only and can be field-upgraded to a Model 684-101 Card Read/Punch unit. Both Hollerith and binary code can be read and punched, either in one pass or in separate passes. Can operate as a card reader, card punch, or reader/punch for updating punched card files. Has a 1200-card input hopper and a 1300-card output stacker plus a card offset capability. Attaches to a position on a common trunk. Available for Century 101, 151, 200, 201, 251, and 300 systems.

686-102 CARD READ/PUNCH: Reads 80-column cards serially at up to 800 cpm and punches column-by-column at 83 to 294 cpm, depending on the number of columns punched. Has a single card feed path, a 1500-card input hopper, and two 1800-card programmable output stackers plus a 100-card reject stacker. Does not require a controller.

686-111 CARD READ/PUNCH: Reads 80-column cards serially at up to 560 cpm and punches column-by column at 60 to 180 cpm, depending on the number of columns punched. Has a 1500-card input hopper and two 1800-card programmable output stackers plus a 100-card reject stacker. Does not require a controller. Available for the Century 50 as well as for the larger models.

686-201 CARD READER: Reads 80-column cards serially at up to 750 cpm. Has a 1500-card input hopper and two 1800-card programmable output stackers plus a 100-card reject stacker. Does not require a controller. Available for the Century 50 and larger models.

686-302 CARD PUNCH: Punches 80-column cards at 83 to 294 cpm, depending on the number of columns punched. Does not require a controller.

686-311 CARD PUNCH: Punches 80-column cards at 60 to 180 cpm, depending on the number of columns punched. Does not require a controller. Available for the Century 50 and larger models.

687-301 CARD PUNCH: Punches 80-column cards at 100 cpm. Has an 800-card input hopper and an 800-card output stacker. Requires a 622-701 controller.

662-100 INTEGRATED PUNCHED TAPE READER: Available as an integral part of the Century 50 through 201 Basic Systems; may be selected as an alternative to the 682-100 Card Reader. Reads 5-, 7-, or 8-channel punched tape at a peak rate of 1000 characters (100 inches) per second. Can read strips or rolls varying from 1 to 350 feet in length. Standard code is ASCII with even parity, but any user-defined code with either odd or even parity can be read. Does not require a controller. Not available with the Century 251 and 300.

660-101 PUNCHED TAPE READER: Reads 5-, 7-, or 8-channel tape at 1500 char/sec. Uses photoelectric read cells with either continuous or start/stop operation with a rewind rate of 150 inches/sec. Does not require a controller. Available for the Century 50 and larger models.

665-101 TAPE PUNCH: Punches 5-, 7-, or 8-channel tape at 200 char/sec. Operates in either continuous or start/stop mode.

626-101 PRINTER CONTROLLER: Connects any of the following free-standing printers to Century 100 or larger computer system through a common trunk attachment: 640-102, -200, -210, or -300.

640-102 INTEGRATED PRINTER: Integral part of the Century 100 Basic System. Can also be connected to a Century 50, 50 Mod 1, 101, or 151. Has 132 print positions and 64 printable characters. Peak speed is 450 lpm with 64-character set. Optional 52-character set enables all-numeric printing at 900 lpm. Print spacing of 6 or 8 lines per inch is available. Requires a 626-101 Controller for use as an additional free-standing unit with ▶

four more I/O channels, numerous peripheral units, and several worthwhile optional features. For expanded Century 200's (64K bytes or larger), all main memory is of the magnetic core type.

The Century 200 is no longer being manufactured.

THE CENTURY 151 AND 201

The Century 151 provides an intermediate step between the Century 101 and the Century 200 and is the first computer in the NCR product line to use MOS main memory. Although it is equipped with the same instruction set as the Century 101, the 151 features faster instruction execution speeds and main memory cycle times and can be configured with the high-performance Model 658 Disc Units. The basic memory size is 32,768 bytes, and is expandable in increments of either 16K or 32K bytes up to a maximum of 131,072 bytes without change to the physical size of the system. The Century 151 MOS memory has a cycle time of 750 nanoseconds to access one or two bytes of data, nearly twice the speed of the Century 101.

The basic Century 151 configuration includes a processor with 32,768 bytes of MOS main memory, a dual-platter disc unit with a 9.8-million-byte storage capacity, a 300-cpm card reader, a 300-lpm printer, and an I/O writer. Monthly rental for the basic system is $2,975 or $2,675 for a one-year or five-year lease, respectively, and the purchase price is $120,325.

Software support for the Century 151 includes the Basic Executive, On-Line Executive, or B3 Multiprogramming Executive operating system levels and the COBOL, FORTRAN, RPG, BASIC, and NEAT/3 programming languages.

The Century 201 fits squarely between the Century 200 and the Century 251 in price/performance and features enhanced I/O capabilities, large-capacity disc storage units, and multiprogramming capabilities. The Century 201 incorporates core main memory with an access time of 650 nanoseconds and enhanced I/O capabilities. Basic I/O facilities of the Century 201 processor include eight I/O trucks, one of which can accommodate a data transfer rate of 900K bytes per second. As an option, one of the low-speed trunks can be buffered to provide a second 900KB trunk to provide dual access to a second Model 657 "double density" Disc Subsystem and controller. From 65,536 to 524,288 bytes of core main memory can be configured with the system.

A Basic NCR Century 201 system includes a processor with 65,536 bytes of core memory, a 300-cpm card reader, a 1500-lpm printer, and a 96-million-byte dual-spindle disc unit. Monthly rental is $6,625 on a one-year lease and $5,650 on a five-year lease, and purchase price is $300,000.

With the exception of a nearly doubled total system I/O data rate and expanded on-line mass storage capabilities, the Century 201 offers the same instruction set and processing power as large Century 200 systems equipped with 650-nanosecond core memory, and will supplant the older Century 200 in NCR's marketing line-up. Rental prices for the older Century 200 basic system,

a Century 100 or 101, and for attachment to Century 151 systems.

640-122 PRINTER: Standard printer in the Century 50 Basic System. Prints up to 200 alphanumeric lines per minute. Has 132 print positions and 64 printable characters. Print spacing is 6 or 8 lines per inch. Available for the Century 50 and Century 50 Mod 1 only. Does not require a controller.

640-132 PRINTER: Can be selected as a higher-speed substitute for the basic 640-122 Printer on the Century 50 and 50 Mod 1 only. Has 132 positions and a standard set of 64 printable characters. Prints up to 300 alphanumeric lines per minute. Optional 51-character set with double numerics permits all-numeric printing at 600 lpm. Print spacing of 6 or 8 lines per inch is available. Does not require a controller.

640-200 PRINTER: Usable as integrated printer in the basic Century 200 system. Can also be connected to Century 100 or larger system as a free-standing unit via the 626-101 Controller. Has 132 print positions and 64 printable characters, with 160 print positions and a 52-character print set optionally available. Peak speed is 1,500 lpm. Optional 52-character set enables all-numeric printing at 3,000 lpm. Continuous Form Tab Set Handling is available. Not usable with the Century 50 or 101.

640-210 PRINTER: Same as the 640-200, except has 160 print positions.

640-300 PRINTER: Usable in the same manner as the 640-200, including installation as the integral printer in the Century 101 system. Has 132 print positions and up to 128 printable characters (double alpha). Peak speed is 1,200 lpm. Requires the 626-101 Controller for attachment to a common trunk.

646-201 TRAIN PRINTER: Prints at up to 1,200 lines per minute with 16, 20, 44, or 48 character sets and somewhat slower speeds with 52, 57, 64, or 96 character sets. Maximum speed in the burst mode is 2,500 lines per minute with a 16-character set. Has 132 print positions. Print spacing of 6 or 8 lines per inch is available. Has an integrated controller. Available with the Century 101, 151, 251, and 300.

647-201 TRAIN PRINTER: Prints at a peak speed of 2,000 lines per minute with a set of up to 48 characters, and at 3,500 lines per minute in the burst mode with a 16-character set. Can be equipped with 16, 20, 44, 46, 48, 52, 57, 64, or 96 character sets. Prints at 6 or 8 lines per inch in 132 print positions. Includes an integrated controller. Available with Century 101, 151, 200, 201, 251, and 300 systems.

6101 I/O WRITER: Standard in the Century 200 system and optional in the Century 50, 100, and 101, this I/O unit facilitates operator/computer communication by providing keyboard input and typed hard-copy output at a rated speed of 6 characters per second. It consists of an ASCII keyboard and a typing unit with pin-feed platen.

420-1/420-2 OPTICAL CHARACTER READERS: Both models read journal tapes imprinted with NCR Optical Font (NOF) characters at 52 lines per second. From 1 to 32 characters can be read from each line, and the units recognize 10 stylized numeric digits and 6 special symbols. Differences between the 420-1 and 420-2 include the following:

	420-1	420-2
Journal roll length	100 feet (max.)	130 feet (max.)
Transport speed	6.5 ips	13 ips
Read speed	26 lines/sec (max.)	52 lines/sec (max.)
	832 cps	1664 cps
Rescan time	160 msec/line	40 msec/line
Manual entry required	entire line	unreadable characters

NCR Century Series

CHARACTERISTICS OF THE CENTURY SERIES SYSTEMS

	Century 50	Century 100	Century 101	Century 151	Century 200	Century 201	Century 251	Century 300
SYSTEM CHARACTERISTICS								
Maximum no. of processors supported by standard software	1	1	1	1	1	1	1	1
Operating systems	B1, B2	B1, B2	B1, B2	B1, B2	B1, B2, B3	B1, B2, B3	B1, B2, B3, B4	B1, B3, B4
Typical system rental	$1,800	$2,600	$3,600	$4,600	$5,500	$8,200	$14,000	$19,000
MAIN STORAGE								
Cycle time, microseconds	0.8	0.8	1.2	0.75	0.8 or 0.65*	0.65	0.68	0.68
Bytes accessed per cycle	1	1	2	2	2	2	4	4
Minimum capacity, bytes	16K	16K	16K	32K	32K	64K	96K	128K
Maximum capacity, bytes	32K	32K	128K	128K	512K	512K	512K	4096K
Storage increment size, bytes	16K	16K	8K or 16K	16K or 32K	16K or 32K	32K, 64K, or 128K	32K or 64K	128K
Main storage type	Thin-film, short-rod	Thin-film, short-rod	Core	MOS	Thin-film, short-rod*	Core	Core	Core
Interleaving	None	None	None	None	None	None	2-way	4-way/8-way
Storage protection	None	None	Optional	Optional	Optional	Optional	Standard	Standard
Reserved storage, bytes	1,280	1,280	1,280	1,280	1,280	1,280	3,072	3,072
CENTRAL PROCESSORS								
No. of hardware instructions	19	19	37	37	66	67	71	71
Index registers	63	63	63	63	63 for each active program	63 for each active program	63 for each active program	63 for each active program
Maximum no. of interrupts	2	2	9	9	8	8	16	16
Floating-point hardware	None	None	None	None	Optional	Optional	Standard	Standard
Decimal instructions	2	2	5 (+2 opt.)	5 (+2 opt.)	5 (+1 opt.)	5 (+1 opt.)	9	9
Divide hardware	None	None	Optional	Optional	None	None	Standard	Standard
Indirect addressing	None	None	5 levels	5 levels	5 levels	5 levels	5 levels	5 levels
IBM 1400 Series compatibility	None	None	None	None	Optional	Optional	None	None
NCR 315 compatibility	None	None	None	None	Optional	Optional	Optional	Optional
INSTRUCTION TIMES (fixed-point decimal, in microseconds):								
Add, unsigned, unpacked (5 digits)	59	59	28.8	18.0	18 (or 15)*	15	9.9	9
Add, signed, packed (5 digits)	**	**	25.2	15.8	14 (or 11)*	11	9.0	7.2
Multiply, unsigned, unpacked (5 digits)	**	**	**	**	**	**	**	20
Multiply, signed, packed (5 digits)	**	**	127.2	79.5	129 (or 105)*	105	22.8	18.5
Divide, unsigned, unpacked (5 digits)	**	**	**	**	**	**	**	15.3
Divide, signed, packed (5 digits)	**	**	134.4	84.0	**	**	11.1	12.9
I/O CONTROL								
Total number of trunks	2	2	4	4	8	8	7	11
Maximum aggregate I/O data rate, bytes/sec	148KB	148KB	416KB	1,056KB	900KB	1,700KB	2,700KB	4,300KB
Common trunk transmission rates, bytes/sec:								
Standard trunks	108KB***	108KB 40KB	416KB 120KB	545KB 120KB	2 x 130KB 77KB*** 1KB***	3 x 120KB 2 x 487KB 1 x 900KB	2 x 826KB 173KB	6 x 850KB 210KB***
Optional additional trunks	40KB	None	277KB 120KB	900KB 120KB	2 x 420KB 2 x 130KB	77KB*** 1KB***	4 x 826KB 900KB	4 x 1,100KB

*0.8-microsecond thin-film memory is used in 32K and 48K Century 200 systems; larger Century 200's use 0.65-microsecond core memory, resulting in faster instruction times.

**Handled by subroutine; timings not available.

***Integrated trunk. On the Century 300, the 8-position integrated multiplexer can accommodate a data transfer rate up to 190KB on any one position, subject to an overall multiplexer data rate of 210KB.

▷ In the summer of 1974, NCR disclosed that it had achieved its original marketing goal by selling 5,000 Century Series machines. With the heaviest concentration of these systems in the Century 50, 100, and 200 range, the enhanced processor models and attractive pricing of its larger models should strengthen NCR's efforts to maintain and upgrade this customer base.

TECHNOLOGY

NCR design engineers set a bold course in the Century Series with a number of significant technical inno- ▷

► The Century 200 and 201 have 39 standard instructions, including all of the Century 50 or 100 instructions plus facilities for packed, signed, decimal addition and subtraction, editing, code translation, scanning, and bit and character testing. Up to 27 more instructions can be added by the optional features listed below:

Multiply feature: provides fixed-point multiplication of packed decimal fields.

Command feature: provides logic and table compare instructions.

Floating Point feature: provides 12 instructions for floating-point arithmetic in "short" (4-byte) and "long" (8-byte) formats.

▷ vations. Primary among these was the use of a thin-film, short-rod main memory. Prior to NCR's adoption of this memory technology, its use had been limited to state-of-the-art military and advanced engineering systems. (A thin-film long-rod technology was employed earlier in the NCR 315/RMC systems). The use of thin-film, short-rod memory and monolithic integrated circuitry permitted the various smaller Century models to have a "low-boy," table-top look that made them significantly different in appearance from most competitive data processing systems. Furthermore, significant savings in development cost were possible with the thin-film technology, thus permitting more "bang per buck" in other aspects of the system design.

A number of problems, however, were reported among some of the earlier installations of the thin-film, short-rod memory systems. NCR responded positively to the resulting market pressure by providing optional magnetic core memory on the Century 200, and by releasing the Century 300 with magnetic core memory only. Later, the Century 200 configuration rules were revised, retaining thin-film memory on the "basic" system with less than 64K bytes, but providing magnetic core memory for all expanded Century 200 systems. This high-performance magnetic core memory, with a cycle time of 650 nanoseconds per 2-byte access, is 23 percent faster, considerably more compact, and only 5 to 15 percent more expensive (depending upon capacity) than the basic Century 200 short-rod memory. The more recently announced Century 101 and 251 use core memory only, while the newly announced Century 151 marks NCR's first use of metal oxide semiconductor (MOS) main memory.

COMPUTER PERIPHERALS, INC.

High production costs for certain Century Series peripheral devices have been a chronic problem at NCR. This factor, combined with a long-standing and mutually satisfactory original equipment manufacturer's (OEM) arrangement between NCR and Control Data Corporation, was primarily responsible for the formation of an equally owned joint venture between NCR and CDC. Under an agreement announced in principle in January 1972, a jointly owned subsidiary called Computer Peripherals, Inc. was set up to produce magnetic tape equipment, printers, and punched card equipment. International Computers Limited joined the venture in September 1975 with an agreement to eventually acquire a one-third interest in CPI and to establish a peripherals manufacturing facility in the United Kingdom.

CPI now supplies all card, tape, and printer peripheral equipment for both NCR and CDC, and CDC is also NCR's supplier of disc drives for the Century Series. The magnetic tape subsystems, card processing equipment, and high-speed printers most recently released for Century Series processors plus the Model 658 100-million-byte and 200-million-byte Disc Units are products of the CDC-NCR arrangement, which should assure the continuing availability of top-quality peripheral equipment at substantially reduced manufacturing costs to NCR. ▷

▶ Multiprogramming feature: provides base and limit address registers, interval timer, and other hardware facilities to make multiprogrammed operation practical.

Trace (Console Debug) feature: provides 3 special instructions to facilitate program debugging.

NCR 315 Compatibility feature: provides 3 additional instructions and a separate Emulation Unit, enabling a Century 200 to execute programs written for NCR 315 computers.

IBM 1401 Compatibility feature: provides special instructions that facilitate software simulation of IBM 1401, 1440, or 1460 computers. Internal speed of the Century 200 in Compatibility mode is about 1.5 times that of the original 1401.

The Century 251 and 300 have 71 instructions, all standard, including all of the Century 200 instructions except those associated with the optional NCR 315 and IBM 1401 Compatibility features. There are 7 classes of Century 251/300 instructions:

Decimal Arithmetic: 9 instructions for adding, subtracting, multiplying, dividing, and comparing signed, packed BCD fields; for adding and subtracting unsigned, unpacked BCD fields; and for packing and unpacking BCD fields.

Fixed-Point Binary: 10 instructions for adding, subtracting, multiplying, dividing, and shifting word-oriented (4-byte) binary operands; for adding, subtracting, and comparing variable-length binary fields; and for performing binary-to-decimal and decimal-to-binary conversions.

Floating-Point: 12 instructions for adding, subtracting, multiplying, dividing, and comparing floating-point operands in both short (1-word) and long (2-word) formats.

Data Movement: 3 instructions for internal data transfer operations.

Logical: 8 instructions for editing, scanning, code translation, and Boolean operations.

Transfer: 13 instructions for testing, branching, and counting.

Special: 16 instructions for various hardware functions such as input/output, loading base and limit address registers, repeating an instruction, setting up trace/monitor conditions, handling interrupts, etc.

INSTRUCTION EXECUTION TIMES: See table.

INTERRUPTS: See table.

TIME-OF-DAY CLOCK: In the Century 101, 151, 251, and 300 only, an optional clock register, located in main memory, provides a binary indication of the time of day for use in controlling real-time programs, schedulers, and job accounting routines. The clock is incremented every 25 microseconds.

INPUT/OUTPUT CONTROLS

I/O CHANNELS: See table. Basic Century channels can accommodate 8 I/O positions.

The basic Century 151 operates with a minimum I/O configuration of two common trunks, each with eight I/O positions. Two additional optional trunks can be added to the system to provide an additional 16 I/O positions. One is a low-speed trunk with a transfer rate of 120KB and the second is a high-speed trunk with a 900KB transfer rate.

The basic Century 201 includes eight I/O trunks. Three are common trunks with eight I/O positions and a transfer rate of 120KB each. Two are medium-speed common trunks with a data transfer rate of 487KB, and one is a high-speed common trunk with a 900KB data transfer rate. In addition, there are two slow-speed trunks, one with dedicated positions for a card or paper tape reader, I/O writer, and console, and the second with a dedicated position for a printer. One slow-speed common trunk can be buffered to provide a second 900KB trunk. ▶

NCR Century Series

► CENTURY 50 BASIC SYSTEM: Includes 16K processor, 300-cpm card reader (or 1000-cps punched tape reader), 200-lpm printer, and one dual-spindle disc unit with 153-millisecond average access time (8.4 million bytes total). Monthly rental and purchase prices are $1,700 and $55,850, respectively. For purchased systems, monthly maintenance is $330.

CENTURY 101 BASIC SYSTEM: Consists of 16K processor, dual-spindle disc unit and controller (9.8 million bytes), 300-lpm printer, and 300-cpm card reader. Monthly rental and purchase prices are $2,225 and $80,520. For purchased systems, monthly maintenance is $385.

CENTURY 151 BASIC SYSTEM: Includes 32K processor, dual-spindle disc unit, 300-cpm card reader, 300-lpm printer, and I/O writer. Monthly rental is $2,975 and $2,675 under a 1-year or 5-year lease, respectively. Purchase price is $133,695. For purchased systems, monthly maintenance is $521.

CENTURY 151 EXPANDED SYSTEM: Includes 128K processor with the multiply/divide feature, 1200-lpm printer, 300-cpm card reader, I/O writer, dual-spindle disc unit and controller (96 million bytes), and two optional I/O trunks. Monthly rental under a 1-year lease is $5,420, and purchase price is $275,755. For purchased systems, monthly maintenance is $696.

BASIC CENTURY 201 SYSTEM: Includes 64K processor, dual-spindle disc drive (96 million bytes), 300-cpm card reader, and 1500/3000-lpm printer. Monthly rental is $6,625 or $5,650 on a 1-year or 5-year lease, respectively. Purchase price is $300,000. Monthly maintenance for purchased systems is $728.

EXPANDED CENTURY 201 SYSTEM: Includes 256K Century 201 processor and main memory, two dual-spindle disc drives (192 million bytes), 300-cpm card reader, card read/punch (800 cpm/83-294 cpm), 1500/3000-lpm printer, five magnetic tape units (160KB), and I/O writer. Monthly rental under a 1-year lease is $14,605. Purchase price is $634,425. For purchased systems, monthly maintenance is $1,737.

CENTURY 251 PACKAGED SYSTEM: Consists of 192K-byte Century 251 processor and main memory, two

dual-spindle disc units (120 million bytes), 1500-lpm printer, and 300-cpm card reader. Monthly rental for a 1-year lease is $12,465 and for a 5-year lease is $10,645. Purchase price is $490,090 and monthly maintenance is $1,710.

CENTURY 300 MEDIUM SYSTEM: Consists of a 512K processor, four disc drives and controller (400 million bytes), four magnetic tape units (160KB), one 1200-cpm card reader, one card punch, and two 2000-lpm printers. Monthly rental for a 1-year lease is $23,260. Purchase price is $976,700 and monthly maintenance is $4,327.

SUPPORT: NCR systems support is billed to Century 50, 100, 101, and 201 users at the rate of $20 per hour or $120 per day. NCR systems support for the Century 251 and 300 and/or on-line systems cost $25 per hour or $150 per day.

For all Century models, each user is entitled to a maximum amount of "free" NCR support equal to twice the monthly rental of the system. Additional support is billed separately at the above rates.

EDUCATION: All educational services are separately priced. Each Century 50 or Century 50 Mod 1 installation receives a training allowance of $1,000, which provides approximately 4 man-weeks of training. The user of a basic Century 100 or 101 system receives an educational allowance of $2,000, while the allowance for a basic Century 200 or 201 system is $3,000. Each Century 251 system receives a total educational allowance of $6,000 over the life of the system, which provides basic training for four people.

CONTRACT TERMS: The standard NCR Century rental contract permits unlimited use of the equipment for all processor models. There are no extra-use charges. The basic maintenance charge covers maintenance of the equipment for 16 hours a day, from 8 a.m. to 12 p.m., five days per week, Monday through Friday.

A graduated-scale purchase option, applicable to all NCR Century Series equipment, applies 55% of the first 12 months' rental, 45% of the second 12 months' rental, and 30% of the third 12 months' rental charges toward purchase of the equipment.■

EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	Rental (1-year lease)*	Rental (3-year lease)*	Rental (5-year lease)*
BASIC SYSTEMS						
Century 50 Mod 1 Basic System, including:		47,000	347	1,385	1,255	1,150
615-50/616-200	Processor with 16K-bytes thin-film memory					
649-125	Printer, 125 lpm					
655-151	Integrated Dual-Spindle Disc Unit, 8.4 MB					
682-100	Integrated Card Reader, 300 cpm					
Substitutions for Century 50 Mod 1 Basic System:**						
615-50 Mod-1/616-300	Processor with 32K-bytes thin-film memory	4,995	12	325	—	—
640-122	Line Printer, 200 lpm	8,850	-14	265	—	—
640-132	Line Printer, 300/600 lpm	14,850	6	430	—	—
640-102	Line Printer, 450/900 lpm	20,850	22	640	—	—
796-101	CRT Console and Interface	4,000	39	125	—	—
655-101	Integrated Dual-Spindle Disc Unit, 8.4 MB	5,000	41	165	—	—
Century 50 Basic System, including:		55,850	330	1,700	1,570	1,460
615-50/616-200	Processor with 16K-byte thin-film memory					
640-122	Integrated Printer, 200 lpm, 132 positions					
655-151	Integrated Dual-Spindle Disc Unit, 8.4 MB, 153-msec access time					
682-100	Integrated Card Reader, 300 cpm					
Substitutions for Century 50 Basic System:**						
615-50/616-300	Processor with 32K-byte thin-film memory	4,995	12	325	—	—
640-102	Integrated Printer, 450/900 lpm, 132 positions	12,000	36	375	—	—
640-132	Integrated Printer, 300/600 lpm, 132 positions	6,000	20	165	—	—
655-101	Integrated Dual-Spindle Disc Unit, 8.4 MB, 65-msec access time	5,000	41	165	—	—
662-100	Integrated Paper Tape Reader, 1000 cps	0	-20	0	—	—

* Rental prices include equipment maintenance.
** Substitution prices are added to Basic System price.

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EQUIPMENT PRICES

BASIC SYSTEMS (Continued)		Purchase Price	Monthly Maint.	Rental (1-year lease)*	Rental (3-year lease)*	Rental (5-year lease)*
Century 100 Basic System, including:		71,500	458	2,595	2,345	2,220
615-100/616-200	Processor with 16K-byte thin-film memory					
640-102	Integrated Printer, 450/900 lpm, 132 positions					
655-101	Integrated Dual-Spindle Disc Unit, 8.4 MB, 65-msec access time					
682-100	Integrated Card Reader, 300 cpm					
Substitutions for Century 100 Basic System:**						
615-100/616-300	Processor with 32K-byte thin-film memory	4,995	12	420	—	—
640-200/626-101	Printer and Controller, 1500 lpm, 132 positions	35,500	58	990	—	—
640-210/626-101	Printer and Controller, 1500 lpm, 160 positions	39,750	81	1,090	—	—
640-300/626-101	Printer and Controller, 600 lpm, 132 positions	25,450	29	720	—	—
662-100	Paper Tape Reader, 1000 cps	0	-20	0	—	—
Century 101 Basic System, including:		80,520	385	2,225	2,115	2,005
615-101/7001	Processor with 16K-byte core memory					
649-300	Free-Standing Printer, 300 lpm, 132 positions					
656-102	Dual-Spindle Disc Unit and Controller, 9.8 MB, 47.5-msec access time					
682-101	Integrated Card Reader, 300 cpm					
Substitutions for Century 101 Basic System:**						
615-101/7002	Processor with 24K-byte core memory	6,000	12	190	—	—
615-101/7003	Processor with 32K-byte core memory	10,000	17	325	—	—
615-101/7004	Processor with 48K-byte core memory	20,000	29	575	—	—
615-101/7005	Processor with 64K-byte core memory	30,000	41	825	—	—
615-101/7006	Processor with 96K-byte core memory	40,000	53	1,025	—	—
615-101/7007	Processor with 128K-byte core memory	50,000	65	1,225	—	—
657-102/625-202	Dual-Density Disc Unit and Controller, 96 MB, 72.5-msec access time	66,805	70	1,400	—	—
640-102	Integrated Printer, 450/900 lpm, 132 positions	10,100	3	150	—	—
646-201/961-201	Train Printer, 1200 lpm, 132 positions	29,700	195	630	—	—
647-201/961-201	Train Printer, 2000 lpm, 132 positions	45,500	314	1,100	—	—
960-152	52-Character Train	1,750	—	—	—	—
960-164	64-Character Train	1,750	—	—	—	—
655-201/625/101	Dual-Spindle Disc Unit and Controller, 8.2 MB	16,455	34	355	—	—
656-102	Two additional Dual-Spindle Disc Units; 9.98 MB	9,195	91	250	—	—
657-102/625-201	Dual-Spindle Disc Unit and Controller, 60 MB	57,605	31	1,200	—	—
662-100	Paper Tape Reader, 1000 cps	0	-15	0	—	—
6006	Integrated Controller for 640-102 Printer (available on C101 only; requires 9511 Attachment)	3,375	10	75	—	—
6007	Integrated Controller for 640-300 Printer (available on C101 only; requires 9511 Attachment)	5,625	10	125	—	—
9511	Integrated 640-type Printer Attachment (available on C101 only; required for integrated 640-102 or -300)	3,375	15	75	—	—
615-951	Auxiliary Cabinet for I/O writer or integrated printer	800	0	25	—	—
Century 151 Basic System, including:		120,325	521	2,975	2,850	2,675
615-15/7102	Processor with 32K-byte MOS memory					
682-101	Integrated Card Reader, 300 cpm					
649-300	Line Printer and Controller, 300 lpm					
656-102	Dual-Platter Disc Unit and Controller, 9.8 MB, 47.5-msec access time					
6102	Integrated I/O Writer					
615-953	Auxiliary Cabinet for I/O Writer					
Substitutions for Century 151 Basic System:**						
615-151/7104	Processor with 48K-byte MOS memory	11,250	11	0	—	—
615-151/7106	Processor with 64K-byte MOS memory	22,500	22	0	—	—
615-151/7108	Processor with 96K-byte MOS memory	33,750	33	0	—	—
615-151/7110	Processor with 128K-byte MOS memory	45,000	43	0	—	—
662-100	Paper Tape Reader, 1,000 cps	0	-20	0	—	—
640-102	Integrated Printer, 450-900 lpm	10,100	3	150	—	—
640-102/626-101	Printer and Controller; 450-900 lpm	17,350	2	320	—	—
640-300	Integrated Printer, 1200 lpm	23,800	22	600	—	—
640-300/626-101	Printer and Controller, 1200 lpm	28,800	36	720	—	—
646-201/961-201	Printer, 1200 lpm	29,700	195	630	—	—
647-201/961-201	Printer, 2000 lpm	45,500	314	1,100	—	—
655-201/625-101	Disc Unit and Controller, 8.4 MB, 65-msec access time	16,455	34	355	—	—
656-102	Two Removable Disc Pack units, 9.98 MB	9,195	91	250	—	—
657-102/625-201	Disc Unit and Controller, 60MB, 72.5-msec access time	57,605	31	1,200	—	—
657-102/625-202	Disc Unit and Controller, 96MB, 72.5-msec access time	66,805	61	1,400	—	—
6101	Teletype I/O Writer	—2,250	0	-50	—	—
Century 200 Basic System, including:		183,500	616	4,540	4,090	3,865
615-200/617-100	Processor with 32K-byte thin-film memory					
640-200	Integrated Printer, 1500 lpm, 132 positions					
655-201/625-101	Dual-Spindle Disc Unit and Conroller, 8.4 MB, 153-msec access time					
682-100	Integrated Card Reader, 300 cpm					
6101	Integrated Teletype I/O Writer					
Substitutions for Century 200 Basic System:**						
615-200/617-150	Processor with 48K-byte thin-film memory	12,000	0	400	—	—
615-200/617-205	Processor with 64K-byte core memory	41,000	0	1,000	—	—
615-200/617-255	Processor with 96K-byte core memory	61,500	0	1,525	—	—
615-200/617-305	Processor with 128K-byte core memory	82,000	0	2,040	—	—
615-200/617-355	Processor with 192K-byte core memory	123,000	29	3,060	—	—
615-200/617-405	Processor with 256K-byte core memory	164,000	53	4,080	—	—

* Rental prices include equipment maintenance.
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		Purchase Price	Monthly Maint.	Rental (1-year lease)*	Rental (3-year lease)*	Rental (5-year lease)*
BASIC SYSTEMS (Continued)						
615-200/617-455	Processor with 348K-byte core memory	246,000	123	6,120	—	—
615-200/617-505	Processor with 512K-byte core memory	328,000	200	8,165	—	—
640-205	Integrated OCR Printer, 750/1500 lpm, 132 positions	2,800	11	100	—	—
640-210	Integrated Printer, 1500 lpm, 160 positions	4,250	0	100	—	—
640-215	Integrated OCR Printer, 750/1500 lpm, 160 positions	7,050	11	200	—	—
640-300	Integrated Printer, 1200 lpm, 132 positions	—10,050	—29	—270	—	—
647-201/961-201	Train Printer, 2000 lpm, 132 positions	20,650	278	435	—	—
657-102/625-201	Dual-Spindle Disc Unit and Controller, 60 MB, 73-msec access time	41,150	3	845	—	—
662-100	Paper Tape Reader, 1000 cps	0	—20	0	—	—
6216	Thermal I/O Writer	2,250	0	50	—	—
Century 201 Basic System, including:		300,000	728	6,625	5,975	5,650
615-201/617-260	Processor with 64K-byte core memory					
682-100	Integrated Card Reader, 300 cpm					
640-200	Integrated Printer, 1500/3000 lpm					
657-102/625-202	Dual-Spindle Disc Unit and Controller, 96 MB, 72.5-msec access time					
Substitutions for Century 201 Basic System:**						
615-201/617-260	Processor with 96K-byte core memory	14,700	0	355	—	—
615-201/617-310	Processor with 128K-byte core memory	25,200	0	610	—	—
615-201/617-360	Processor with 192K-byte core memory	66,200	35	1,525	—	—
615-201/617-410	Processor with 256K-byte core memory	107,200	59	2,435	—	—
615-201/617-460	Processor with 384K-byte core memory	189,200	135	4,265	—	—
615-201/617-510	Processor with 512K-byte core memory	271,200	217	6,090	—	—
662-100	Paper Tape Reader, 1000 cps	0	—20	0	—	—
640-210	Printer, 1500 lpm	4,250	0	100	—	—
647-201/961-201	Printer, 2000 lpm	20,650	278	435	—	—
655-201/625-101	Dual-Spindle Disc Unit and Controller, 8.4 MB, 65-msec access time	—50,350	—27	1,045	—	—
6216	Thermal I/O Writer	2,250	0	50	—	—
Century 251 Basic System, including:		279,600	1,050	6,800	—	—
615-251/618-053	Processor with 96K-byte core memory					
Substitutions for Century 251 Basic System:**						
615-251/618-103	Processor with 128K-byte core memory	9,400	30	200	—	—
615-251/618-153	Processor with 192K-byte core memory	51,700	155	1,100	—	—
615-251/618-203	Processor with 256K-byte core memory	94,000	280	2,000	—	—
615-251/618-303	Processor with 384K-byte core memory	153,220	530	3,260	—	—
615-251/618-403	Processor with 512K-byte core memory	203,040	780	4,320	—	—
Century 251 Packaged System, including:		490,090	1,710	12,465	11,745	10,645
615-251/618-153	Processor with 192K-byte core memory					
6362	Time-of-Day Clock					
657-102/625-202	Dual-Spindle Disc Unit and Controller, 96 MB, 72.5-msec average access time					
640-200/626-101	Printer and Controller, 1500 lpm, 132 positions					
682-300	Card Reader, 300 cpm					
Substitutions for Century 251 Packaged System:**						
615-251/618-203	Processor with 256K-byte core memory	42,300	125	900	—	—
615-251/618-303	Processor with 384K-byte core memory	101,520	375	2,160	—	—
615-251/618-403	Processor with 512K-byte core memory	151,340	625	3,220	—	—
646-201/961-201	Train Printer	—9,150	+119	—370	—	—
647-201/961-201	Train Printer	6,650	90	229	—	—
960-152	52-Character Train	1,750	0	100	—	—
960-164	64-Character Train	1,750	0	100	—	—
Century 300 Basic System, including:		348,900	1,350	8,700	—	—
615-300/618-100	Processor with 128K-byte core memory					
Substitutions for Century 300 Basic System:**						
615-300/618-200	Processor with 256K-byte core memory	84,600	250	1,800	—	—
615-300/618-300	Processor with 384K-byte core memory	145,700	500	3,100	—	—
615-300/618-400	Processor with 512K-byte core memory	197,400	750	4,200	—	—
BASIC "X" SYSTEMS						
	Century 101X	56,475	268	1,620	1,510	1,400
	Century 151X	96,280	404	2,385	2,260	2,085
	Century 200X	143,000	465	3,595	3,145	2,920
	Century 201X	209,150	550	4,635	3,985	3,660
	Century 251X Packaged System	367,040	1,424	9,760	9,040	7,940
PROCESSOR FEATURES						
For Century 50 Processor:						
5621	Communications Package	19,500	75	425	—	—
5622	BASIC-1 Hardware Package for BASIC-1 support (requires 6101 I/O Writer; Feature 6051 not required)	18,500	60	400	—	—
6051	One Common Trunk (required for non-integrated peripherals or communications devices)	3,000	5	150	—	—
6101	Teletype I/O Writer	4,000	15	100	—	—
For Century 100 Processor:						
6101	Input/Output Writer	4,000	15	100	—	—
6105	I/O Writer Selector Switch Assembly	200	1	5	—	—

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PROCESSOR FEATURES (Continued)		Purchase Price	Monthly Maint.	Rental (1-year lease)*	Rental (3-year lease)*	Rental (5-year lease)*
6106	Software Initiated Alarm	400	2	10	—	—
6107	Remote Audible Alarm	800	1	20	—	—
6108	Extra Loud Alarm	800	1	20	—	—
For Century 101 Processor:						
6001	Multiply/Divide	4,500	10	100	—	—
6002	Integrated Communication Multiplexor	7,875	40	175	—	—
6003	I/O Common Trunks 1 & 6	4,500	10	100	—	—
6010	Logic command	2,350	0	50	—	—
6101	Teletype I/O Writer with Interface	4,000	5	100	—	—
6102	Thermal I/O Writer with Interface	6,250	5	150	—	—
6004	Extended Addressing Logic	4,000	0	50	—	—
6011	I/O Common Trunk 1 and Buffered Trunk 6	5,625	10	125	—	—
6109	796-101 I/O Interface	1,000	4	25	—	—
6104	Multiprogramming	4,700	15	100	—	—
6006	640-102 Integrated Printer Controller	3,375	10	75	—	—
6007	640-300 Integrated Printer Controller	5,625	10	125	—	—
6012	Time of Day Clock	1,125	5	35	—	—
6106	Software Initiated Alarm	400	2	10	—	—
6107	Remote Audible Alarm	800	1	20	—	—
6108	Extra Load Alarm	800	1	20	—	—
9511	640 Integrated Printer Attachment	3,375	15	75	—	—
615-951	Auxiliary Cabinet	800	0	25	—	—
6562	Fixed Disc, 4.9 MB	4,275	17	105	—	—
6563	Dual Disc Attachment	450	3	12	—	—
656-102	Disc Unit, 4.9 MB	13,020	71	340	—	—
For Century 151 Processor:						
6001	Multiply/Divide	4,500	10	100	—	—
6002	Integrated Communications Multiplexer	7,875	40	175	—	—
6011	I/O Common Trunks 1 and 6	5,625	10	125	—	—
6006	640-102 Integrated Printer Controller	3,375	10	75	—	—
6007	640-300 Integrated Printer Controller	5,625	10	125	—	—
6010	Logic Command	2,350	0	50	—	—
6107	Remote Audible Alarm	800	1	20	—	—
6108	Extra Loud Alarm	800	1	20	—	—
6016	101/151 Upgrade Kit	6,255	0	0	—	—
6018	Time of Day Clock	1,125	5	35	—	—
6109	796-101 Interface	1,000	4	25	—	—
6104	Multiprogramming	4,700	15	100	—	—
656-102	Disc Unit, 4.9 MB	13,020	71	335	—	—
6561	Disc Unit Controller	6,750	29	165	—	—
6562	Fixed Disc, 4.9 MB	4,275	17	105	—	—
6563	Dual Disc Attachment	450	3	12	—	—
9511	640 Integrated Printer Attachment	3,375	15	75	—	—
For Century 200 Processor:						
6106	Software Initiated Alarm	400	1	10	—	—
6107	Remote Audible Alarm	800	1	20	—	—
6201	Table Compare and Logic Command (requires 6101 Teletype I/O Writer)	2,350	5	50	—	—
6202	Multiply	2,350	5	50	—	—
6204	Floating Point	7,050	10	150	—	—
6207	Console Debug	1,175	5	25	—	—
6208	Extra Loud Alarm	800	1	20	—	—
6209	Multiprogramming (requires 6201 Feature; includes 6212 Octaplex Feature)	14,100	10	300	—	—
6210	One-High-Speed Trunk	2,350	5	50	—	—
6211	Two High-Speed Trunks	4,700	5	100	—	—
6212/6211	Octaplex with Two High-Speed Trunks	9,400	5	200	—	—
6213/6201	NCR 315 Compatibility with Table Compare and Logic Command	4,700	5	100	—	—
6214/6201	IBM 1401 Compatibility with Table Compare and Logic Command	5,875	10	125	—	—
6215	Interval Timer	1,200	5	30	—	—
6217	Remote Teletype I/O Writer	5,000	10	125	—	—
6218	Remote Thermal I/O Writer	7,250	10	175	—	—
627-201	NCR 315 Emulator Feature (requires Console Debug and 6213 Compatibility Feature)	11,750	32	250	—	—
627-202	IBM 1401 Emulator Feature (requires Console Debug and 6214 Compatibility Feature)	8,000	26	175	—	—
627-203	NCR 315 and IBM 1401 Emulator Feature (requires Console Debug and both 6213 and 6124 Compatibility Features)	18,500	57	400	—	—
For Century 201 Processor:						
6106	Software Initiated Alarm	400	2	10	—	—
6107	Remote Audible Alarm	800	1	20	—	—
6201	Table Compare and Logic Command	2,350	5	50	—	—
6202	Multiply	2,350	5	50	—	—
6204	Floating Point	7,050	10	150	—	—
6206	1401 Compatibility	5,875	10	125	—	—
6207	Console Debug	1,175	5	25	—	—
6208	Extra Loud Alarm	800	1	20	—	—
6212	Octaplex	9,400	5	0	—	—
627-201	NCR 315 Emulator Feature (requires Console Debug and 6213 Compatibility Feature)	11,750	32	250	—	—
627-202	IBM 1401 Emulator Feature (reauires Console Debug and 6214 Compatibility Feature)	8,000	26	175	—	—
627-203	NCR 315 and IBM 1401 Emulator Feature (reauires Console Debug and both 6213 and 6124 Compatibility Features)	18,500	57	400	—	—

*Rental prices include equipment maintenance.
**Substitution prices are added to Basic System price.

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PROCESSOR FEATURES (Continued)		Purchase Price	Monthly Maint.	Rental (1-year lease)*	Rental (3-year lease)*	Rental (5-year lease)*
6213	NCR 315 Compatibility with Table Compare and Logic Command	4,700	5	100	—	—
6214	IBM 1401 Compatibility with Table Compare and Logic Command	5,875	10	125	—	—
6215	Interval Timer	1,200	5	30		
6217	Remote Teletype I/O Writer	5,000	10	125	—	—
6218	Remote Thermal I/O Writer	7,250	10	175	—	—
6219	Century 200/201 Upgrade Kit (Trunk 4)	15,750	10	0	—	—
6220	Second Very High-Speed Trunk	5,000	5	50	—	—
6221	Multiprogramming	7,050	10	150	—	—
For Century 251 Processor:						
6360	Additional High-Speed Trunk Group (first set of two additional trunks)	14,000	20	300	—	—
6361	Additional High-Speed Trunk					
6362	Time-of-Day Clock	2,200	0	50	—	—
682-300	Card Reader	12,500	56	295	—	—
6370	32K-Byte Memory Extension	9,400	30	200	—	—
6371	First 64K-Byte Memory Extension	42,300	125	900	—	—
6372	Second 64K-Byte Memory Extension	42,300	125	900	—	—
6373	128K Memory Extension; expands memory from 256K bytes to 384K bytes	59,220	250	1,260	—	—
6374	128K Memory Extension; expands memory from 384K bytes to to 512K bytes	49,820	250	1,060	—	—
6380	Performance Package; upgrades a 96K-byte Century 251 Processor to a 128K-byte Century 300 Processor	89,300	300	1,900	—	—
6381	Performance Package; upgrades a 128K-byte Century 251 Processor to a 128K-byte Century 300 Processor	79,900	270	1,700	—	—
6382	Performance Package; upgrades a 192K-byte Century 251 Processor to a 256K-byte Century 300 Processor	122,200	395	2,600	—	—
6383	Performance Package; upgrades a 256K-byte Century 251 Processor to a 256K-byte Century 300 Processor	99,900	270	1,700	—	—
6384	Performance Package; upgrades a 384K-byte Century 251 Processor to a 384K-byte Century 300 Processor	81,780	270	1,740	—	—
6385	Performance Package; upgrades a 512K-byte Century 251 Processor to a 512K-byte Century 300 Processor	83,660	270	1,780	—	—
For Century 300 Processor:						
618-100	Standalone 128K-byte Core Memory	150,400	300	3,200	—	—
618-200	Standalone 256K-byte Core Memory	235,000	550	5,000	—	—
618-300	Standalone 384K-byte Core Memory	296,100	880	6,300	—	—
618-400	Standalone 512K-byte Core Memory	347,800	1,050	7,400	—	—
6301	First 128K Memory Extension	84,600	250	1,800	—	—
6302	Back-Up Memory Ports	6,200	0	135	—	—
6303	Time-of-Day Clock (in core memory)	2,200	0	50	—	—
6304	Four Very High-Speed Trunks	11,500	50	250	—	—
6305	Three Back-Up Memory Ports	6,200	14	135	—	—
6306	Six Back-Up Memory Ports	12,400	27	270	—	—
6310	Second 128K Memory Extension	61,100	250	1,300	—	—
6311	Third 128K Memory Extension	51,700	250	1,100	—	—
682-300	Card Reader	12,500	61	300	—	—
MASS STORAGE						
625-101	Controller for up to four 655-201 Disc Units	14,000	16	305	—	—
625-201	Single-Density Controller for up to eight 657-type spindles (available on Century 151, 200, 201, 251, and 300; requires High-Speed Trunk)	40,250	40	875	805	745
625-202	Dual-Density Controller for up to eight 657-type spindles	49,450	70	1,075	990	915
625-301	Controller for up to eight 658-101 Disc Units (available on Century 251 and 300)	42,000	200	1,000	—	—
0658-0001	Drive Expansion Feature; required for attaching more than eight 658-01 Disc Units to a 625-301)	2,250	10	50	—	—
655-102	Second Dual-Spindle Disc Unit for Century 50 or 100 only (does not require controller); 8.4 MB, 65 msec access time	28,750	130	650	—	—
655-152	Second Dual-Spindle Disc Unit for Century 50 only (does not require controller); 8.4 MB, 152 msec access time	26,500	75	550	—	—
655-201	Common Trunk Disc Unit; (requires 625-101 controller) 8.4 MB, 65 msec access time	26,500	135	640	—	—
955-1	Disk Pack for 655-type disc units; 4.2 MB	245	—	11.50	—	—
656-102	Disk Unit; 4.9 MB, 47.5 msec access time (requires disc controller)	13,020	60	310	—	—
6562	Fixed Disc; 4.9 MB, 47.5 msec access time (add-on unit for 656-102)	4,275	15	95	—	—
6563	Dual Spindle Attachment for second 656-102 (requires 6561 Disc Controller)	450	2	10	—	—
6561	Disc Unit Controller for one or two 656-102's (available for all Century models)	6,750	25	150	—	—
956-1	Disc Pack for 656-102; 4.9 MB	130	—	—	—	—
657-102	Dual-Spindle Disc Unit, 60 MB or 96 MB (96 MB capacity requires 625-202 Controller; 60 MB capacity requires 625-201 or -202):					
	First Unit	41,400	108	915	840	775
	Second Unit	32,200	108	715	655	605
	Three or more units	27,600	108	615	565	520
957-1	Disc Pack for 657-type disc units; 30 MB or 48 MB	260	—	20	—	—

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		Purchase Price	Monthly Maint.	Rental (1-year lease)*	Rental (3-year lease)*	Rental (5-year lease)*
MASS STORAGE (Continued)						
625-301	Controller for up to eight 658-301 Disc Units	38,200	200	900	855	810
658-201	Disc Drive, 100 MB	24,000	115	615	585	560
0658-0002	200 MB Feature	14,200	45	300	285	270
0625-0002	Drive Expansion Feature; required to attach more than 8 drives to 625-301	2,250	10	50	50	50
958-2	Disc Pack	860	NA	NA	NA	NA
INPUT/OUTPUT UNITS						
624-111	Controller for up to eight 633-111 and/or 633-121 Magnetic Tape Units	18,060	24	435	—	—
624-119	Controller for up to eight 633-119 Magnetic Tape Units (available for Century 50 with 6051 feature)	12,600	24	310	—	—
624-211	Controller for up to eight 633-211 Magnetic Tape Units	21,000	24	510	—	—
624-179	Controller for up to eight 633-119 and/or 633-117 Magnetic Tape Units with same speeds (requires 6101 feature on Century 50, 100, or 101; available for Century 50 with 6051 Feature)	13,020	24	315	—	—
624-311	Controller for up to eight 633-311 Magnetic Tape Units	23,100	24	560	—	—
624-401	Controller for up to eight 635-109 and/or 635-209 Magnetic Tape Units	24,150	65	580	—	—
0624-0001	Dual Model for 624-401 Controllerj permits NRZI and PE operation	1,925	20	55	—	—
633-111	Single Magnetic Tape Unit; PE, 80K3, 9-track, 1600 bpi	12,600	71	310	—	—
633-117	Single Magnetic Tape Unit; NRZI, 10/28/40KC, 7-track, 200/556/800 bpi (available on Century 50 with 6051 feature)	13,650	76	330	—	—
633-119	Single Magnetic Tape Unit; NRZI, 40KB, 9-track, 1600 bpi (available for Century 50 with 6051 feature)	14,700	76	365	—	—
633-121	Dual Magnetic Tape Unit; PE, 80KB, 9-track, 1600 bpi	24,750	105	560	—	—
633-211	Single Magnetic Tape Unit; PE, 144KB, 9-track, 1600 bpi (requries high-speed trunk; not available for Century 100)	21,375	71	485	—	—
633-311	Single Magnetic Tape Unit; PE, 240KB, 9-track, 1600 bpi (requires high-speed trunk; not available for Century 100)	22,050	71	535	—	—
634-117	Magnetic Tape Unit with Controllerj NRZI, 5/13.9/20KC, 7-track, 200/556/800 bpi	26,670	123	645	—	—
634-107	Magnetic Tape Unit; up to three per 634-117	10,710	68	260	—	—
634-119	Magnetic Tape Unit with Controller; PE, 40KB, 9-track, 1600 bpi	25,830	112	625	—	—
634-109	Magnetic Tape Unit; up to three per 634-119	10,500	63	255	—	—
634-219	Magnetic Tape Unit with Controller; PE, 80KB, 1600 bpi	30,870	117	745	—	—
634-209	Magnetic Tape Unit; up to three per 634-219	12,810	68	310	—	—
0634-0001	Dual Mode for 634-119/219; permits attachment of 634-107	630	8	15	—	—
0634-0004	Dual Mode for 634-119/109 Magnetic Tape Units; permits NRZI and PE operation	630	8	15	—	—
0634-0005	Dual Mode for 634-219/209 Magnetic Tape Units; permits NRZI and PE operation	630	8	15	—	—
635-109	Magnetic Tape Unit; PE, 160KB, 1600 bpi	21,375	103	485	—	—
635-209	Magnetic Tape Unit; PE, 320KB, 1600 bpi	24,150	112	585	—	—
0635-0001	Dual Mode for 635-109/209 Magnetic Tape Units; permits NRZI and PE operation	1,125	12	25	—	—
0635-0002	High Altitude Kit for 635-109 Magnetic Tape Unit	0	0	0	—	—
0635-0003	High Altitude Kit for 635-209 Magnetic Tape Unit	0	0	0	—	—
680-201	Card Reader, 1200 cpm	32,500	141	705	—	—
684-101	Card Read/Punch, 500/100-460 cpm	25,830	254	635	—	—
684-301	Card Punch, 100-460 cpm	22,860	222	560	—	—
686-102	Card Read/Punch, 800/83-294 cpm	24,000	124	530	—	—
686-111	Card Read/Punch, 560/60-180 cpm (available for Century 50 with 6051 feature)	20,500	135	440	—	—
686-201	Card Reader, 750 cpm (available for Century 50 with 6051 feature)	14,750	81	330	—	—
686-302	Card Punch, 83-294 cpm	20,500	135	440	—	—
686-311	Card Punch, 60-180 cpm (available fro Century 50 with 6051 feature)	14,750	135	335	—	—
687-301	Card Punch and Controller, 100 cpm	15,500	112	355	—	—
660-101	Paper Tape Reader, 1500 cps (available for Century 50 with 6051 feature)	14,750	41	325	—	—
665-101	Paper Tape Punch, 200 cps (available for Century 50 with 6051 feature)	18,000	64	400	—	—
640-102	Printer, 450/900 lpm, 132 positions (requires 626-101 Controller)	27,500	71	620	—	—
640-200	Printer, 1500/3000 lpm, 132 positions (requires 626-101 Controller for Common Trunk attachment)	49,000	129	1,285	—	—
640-210	Printer, 1500/3000 lpm, 160 positions (requires 626-101 Controller for Common Trunk attachment	53,250	129	1,385	—	—
640-300	Printer, 1200 lpm, 132 positions (requires 626-101 Controller)	38,950	100	1,015	—	—
626-101	Printer Control Unit for Common Trunk attachment of 640-102, 640-200, 640-205, 640-210, 640-215, or 640-300 Printer for Century 100 and larger systems	14,000	29	325	—	—
6401	6/8 Lines Per Inch for 640-102 Printer	1,000	0	25	—	—
6402	Continuous Form Tab Set Handling Feature for 640-200 Printer	300	2	10	—	—
646-201/961-201	Train Printer and Control, 1200 lpm, 132 positions	53,850	288	1,250	—	—
647-201/961-201	Train Printer and Controller, 200 lpm, 132 positions	69,650	407	1,720	—	—
960-152	Print Train; 52 characters	2,950	Time & Mat'ls.	100	—	—

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		Purchase Price	Monthly Maint.	Rental (1-year lease)*	Rental (3-year lease)*	Rental (5-year lease)*
INPUT/OUTPUT UNITS (Continued)						
960-164	Print Train; 64 characters	2,950	Time & Mat'ls.	100	—	—
960-157	Print Train, 57 characters, OCR-A	2,950	Time & Mat'ls.	100	—	—
960-196	Print Train, 96 characters	2,950	Time & Mat'ls.	100	—	—
649-300	Printer; 300 lpm, 132 positions (includes controller) for C101, 200 or 300	24,150	93	620	—	—
6491	6/8 Lines per Inch for 649-300 Printer	675	1	15	—	—
670-101	MICR Sorter, 600 dpm, 11 pockets (includes 622-401 Controller; available for Century 50 with 6051 feature)	45,000	192	1,060	—	—
671-101	MICR Sorter, 1200 dpm, 18 pockets (includes 622-401 Controller; not available for Century 50 or 100)	117,500	618	2,540	—	—
6711	Endorser Feature for 671-101	12,000	49	320	—	—
420-1	Optical Character Reader (requires 622-301 Controller)	48,000	199	1,275	—	—
420-2	Optical Character Reader (requires 622-301 Controller)	68,000	286	1,800	—	—
622-301	OCR Control Unit for 420-1 or 420-2 Reader	7,000	11	160	—	—
622-201	Controller for 735/736 Magnetic Tape Encoders having special Century compatibility feature (available for Century 50 with 6051 feature)	8,250	12	185	—	—
636-301	Cassette Handler	9,000	77	225	—	—
636-0001	Dual Cassette Transport Feature	2,000	10	50	—	—
COMMUNICATION CONTROL						
621-101	Communications Multiplexor (15 lines)	12,000	43	210	—	—
690-101	Auxiliary Cabinet for 621-101	2,500	0	50	—	—
621-102	Communications Multiplexor (250 lines)	22,750	45	475	—	—
690-201	Auxiliary Cabinet for 621-102	12,500	5	250	—	—
621-103	Communications Multiplexor (256 lines)	12,000	38	210	—	—
692-100	Asynchronous Character Adapter for 621-101/102	1,785	10	65	—	—
621-103	Communications Multiplexor (256 lines)	12,000	38	210	—	—
692-600	Asynchronous Adapter for 621-103	1,500	8	80	—	—
693-600	Synchronous Adapter for 621-103	2,250	8	105	—	—
691-101	Secondary Cage for 621-103	7,500	8	120	—	—
690-103	Auxiliary Bay	8,000	3	160	—	—
691-102	Secondary Cage for 690-103	7,500	9	120	—	—
692-401	Asynch. Polling Adapter for 621-101/102; 1 line/cage	3,000	11	105	—	—
692-402	Asynch. Polling Adapter for 621-101/102; 2 lines/cage	4,200	16	150	—	—
692-403	Asynch. Polling Adapter for 621-101/102; 3 lines/cage	6,000	22	175	—	—
692-405	Terminal Adapter for 621-101/102; 1 line/cage	3,000	16	105	—	—
692-406	Terminal Adapter for 621-101/102; 2 lines/cage	4,200	22	150	—	—
693-200	735/736 Encoder Adapter for 621-101/102	8,250	16	180	—	—
693-300	General-Purpose Synchronous Adapter	3,875	27	130	—	—
6921	End of Message Feature (for 621-102 only)	950	0	20	—	—
693-600	Asynchronous Adapter (for 621-103)	1,500	8	80	—	—
693-600	Synchronous Adapter (for 621-103)	2,250	8	80	—	—
695-600	Auto Dialer	1,500	10	47	—	—
698-300	Integrated Asynchronous Modem	1,000	8	32	—	—
752-200	Freestanding Asynchronous Modem	1,100	8	37	—	—
753	Modem	695	8	27	—	—
6901	Transparency Feature	675	0	15	—	—
6902	Wide Band Feature	450	0	10	—	—
796-101	TTY-Compatible CRT Terminal	2,000	32	85	—	—
796-201	Block/Conversational CRT Terminal	3,000	32	140	—	—
796-301	Pollable CRT Terminal	3,500	38	160	—	—
260-1	Thermal Printer	1,960	825	75	—	—
0796-0001	Parallel Printer Interface	185	—	8	—	—
0796-0002	Graphics	230	—	10	—	—
0796-0003	Built-In Acoustic Coupler	460	8	25	—	—
0796-0004	Current Loop Interface	155	—	5	—	—
692-100	Asynchronous Character Adapter for 621-101/102	1,785	10	65	—	—
621-103	Communications Multiplexor (256 lines)	12,000	38	210	—	—
692-600	Asynchronous Adapter for 621-103	1,500	8	80	—	—
693-600	Synchronous Adapter for 621-103	2,250	8	105	—	—
691-101	Secondary Cage for 621-103	7,500	8	120	—	—
690-103	Auxiliary Bay	8,000	3	160	—	—
691-102	Secondary Cage for 690-103	7,500	9	120	—	—
692-401	Asynch. Polling Adapter for 621-101/102; 1 line/cage	3,000	11	105	—	—
692-402	Asynch. Polling Adapter for 621-101/102; 2 lines/cage	4,200	16	150	—	—
692-403	Asynch. Polling Adapter for 621-101/102; 3 lines/cage	6,000	22	175	—	—
692-405	Terminal Adapter for 621-101/102; 1 line cage	3,000	16	105	—	—
692-406	Terminal Adapter for 621-101/102; 2 lines/cage	4,200	22	150	—	—
693-200	735/736 Encoder Adapter for 621-101/102	8,250	16	180	—	—
693-300	General Purpose Synchronous Adapter for 621-101/102	3,875	27	130	—	—
6901	Transparency Feature	675	0	15	—	—
6902	Wide Band Feature	450	0	10	—	—
5621	Century 50 Binary Synchronous Communication Package (requires 6101 I/O Writer; feature 6051 not required)	20,500	75	425	—	—

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