

NCR 8400 and 8500 Systems

New Product Announcement

NCR chose Thursday, November 7, to announce the latest members of its Criterion family, the I-8410 and the new V-8600 processors. The I-8410 is the new low-end member of the Criterion family, while the V-8600 series forms the high end of the family and moves NCR solidly into the large-scale mainframe business. In the software arena, VRX Release 2 is now available.

THE I-8410: This new processor provides 75 percent of the power of the I-8430 and runs under IRX. Memory for the I-8410 uses 16K-bit chips and begins at 256K bytes, with the upper limit defined as one million bytes.

Also announced with the I-8410 was the NCR 6530 Cartridge Disk Drive, which provides 13.5 megabytes of storage on removable media and 67.5 megabytes on fixed media for a total drive capacity of 81 megabytes. The 6530 uses 512-byte sectors. Average head positioning time is 30 milliseconds, and average rotational delay is 18.3 milliseconds. The data transfer rate is 1.21 megabytes per second. Up to eight 6530 Disk Drives may be configured with the I-8410 for a total mass storage capacity of 684 megabytes. The 6530 features rotational position sensing and overlapped seek and search as standard.

Virtually all peripherals available for the I-8430 can be configured with the I-8410. These include the 300-lpm, 600-lpm, and 900-lpm 6420 Series Line Printers; the 8440 Matrix Printer; the 636 Philips-Type Cassette Unit; the 6831 Card Reader; the 657 and 6590 Disk Drives; and the 796 Visual Display Terminals (workstations). The I-8410 can handle up to 20 communications lines through an integrated communications control. A communications multiplexer for an additional 128 lines will be available in the near future.

A typical I-8410 configuration includes a processor with 256K bytes of memory, workstations, a 81-megabyte disk drive, and a 300-lpm line printer. Purchase price is \$105,130, with a 5-year lease priced at \$2,580 per month. I-8410 deliveries will begin in the first quarter of 1979.

NCR will also make available combined memory/mass storage packages. The largest package includes one million bytes of memory and 324 megabytes of disk storage, and may be purchased or leased on a one-year basis. A smaller package consisting of 256K bytes of memory and 81 megabytes of disk storage is also available.

THE V-8600 SERIES: NCR's new line of large-scale computers initially consists of the V-8650 and the dual-processor V-8670, both of which use 64K-bit memory chips, emitter-coupled logic, high-speed cache memory, internal transfer bus architecture, and multiple virtual machine capabilities. Like other members of the 8000 family, the V-8650 and V-8670 are based on NCR's "migration path engineering" concept, which allows a customer application to be transported from the smallest N-mode or V-mode 8000 processor or Century processor to any processor in the 8000 series.

The V-8650, according to NCR, delivers approximately 10 percent greater throughput than the IBM 3032. The largest V-8670 has approximately five times the internal processing power of NCR's V-8590. Both the V-8650 and V-8670 are based on the architecture of the 8500 with an enhanced microinstruction set (fewer microinstructions per function), larger dynamic address translation table, faster processor cycle, cache memory, microinstruction jump/return stack, memory assist register set (MARS), and arithmetic assist unit.

The 8600 family operates under NCR's established and bundled Virtual Resource Executive (VRX) operating system. Each program may have up to 16 megabytes of virtual storage employing pages of 1K, 2K, or 4K bytes. Languages are unbundled and include COBOL, FORTRAN, NEAT/3, and RPG.

Since the processors in the 8600 family have a larger dynamic address translation unit (32 registers) than those in the 8500 family, the hit rate when accessing memory in the virtual storage mode is higher. The hit ratio is stated to be in the 95 percent range for the system software. NCR claims its 32K-byte (V-8650) or 128K-byte (V-8670) cache memory can reduce memory access time by a factor of six. The V-8600 internal transfer bus has a 32-bit-wide data path and can transfer data between subsystems (processor, memory, I/O) at a rate of 72 million bytes per second. The processors have a cycle time of 28 nanoseconds and employ a three-stage pipelining technique for executing instructions.

The memory assist register set (MARS) manages all memory access functions and many repetitive-type functions that would otherwise be handled by microinstruction routines. The processor issues commands and operand addresses to the MARS and then may go on to other functions. The MARS performs the specified commands while the processor executes other functions. 

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- ▷ The arithmetic assist unit hardware performs arithmetic functions that are performed by micro-code in the 8500 processors. The functions include decimal-to-binary and binary-to-decimal conversion, word binary and packed decimal multiplication and division, and floating-point arithmetic. This greatly increases the execution speed of these particular functions.

The system control unit employs two medium-scale 16-bit processors with two-stage pipelines that execute microinstructions at the rate of one instruction per processor cycle (112 nanoseconds). These processors monitor all system elements continuously on a millisecond basis. The unit controls two visual-display stations and functions as the operator control center, microprogram input device, and system-diagnostics unit. Either of the system consoles or a remote console can be used to perform diagnostic routines concurrently with normal operations. Diagnostic routines and firmware are loaded into the system via flexible disk. The remote console can be located at a regional or national service center and linked to the system via telephone lines. The dual nature of the system control unit provides a backup scheme that helps to ensure that no single-point failure will cause a critical system failure.

The input/output subsystem includes from two to four channel-control processors. These attach to the system bus and can control up to 32 channels. Each channel has a 2-million-bytes-per-second transfer rate. The serial I/O channels feed directly into a switching center called the Dynamic Channel Exchange, which automatically routes the data to one of the channel control processors for transmission to other system elements.

The second portion of the I/O subsystem, the I/O trunk hardware, comprises the Trunk Channel Control Processor (TCCP), the Trunk Driver/Receivers (D/R), and the Very High-Speed (VHS) Trunk interface to the Internal Transfer Bus. The Trunk Channel Control Processor (TCCP) is a microcoded I/O processor that selects and initiates all peripherals connected to the system via the trunks. Two types of trunks offer low-speed, multiplexed operation (as with a communications multiplexer) and very high-speed operation (as with magnetic tape units). The TCCP transfers a byte at a time between memory and the peripherals on the low-speed trunks. The high-speed trunk, on the other hand, transfers four-byte words directly between the memory and the peripherals without going through the TCCP.

The TCCP also provides a card reader interface that connects a 600- or 1000-cpm card reader to the system. The card reader can also be attached, via a peripheral controller, to a channel.

Multiprocessing in the V-8670 has been implemented via a tightly coupled architecture. The dual processors share a common transfer bus, access to common memory, and common I/O devices. The system is controlled by a single resident operating system which controls system interaction down to the lowest level. Performance is rated at 1.7 times that of a single processor because each processor can be active at the same time in different threads of the same or different jobs. Because of a common job pool, load leveling is automatic and requires no action by the operator. The V-8670 also offers uni-processor file sharing techniques, dynamic resource allocation, and no operational differences to the user between a single-processor system and multiprocessor system.

The following table compares the characteristics of the V-8650 and V-8670:

	<u>V-8650</u>	<u>V-8670</u>
Processors in system	1	2
Speed (nanoseconds)	28	28
Cache memory size (bytes)	32K	128K
Instruction Storage Unit Size (bytes)	96K	192K
Internal transfer subsystem (nanoseconds)	56	56
Memory (error correcting, 4-way interleaved, 64-bit chips):		
Cycle time (nanoseconds)	380	380
Bytes accessed per cycle	16	16
Minimum capacity (in millions of bytes)	4	4
Other sizes (in millions of bytes)	6 or 8	6, 8, 12, or 16
Increment size (in millions of bytes)	2	2 or 4*
I/O channel control processors (std.)	2	2
I/O channel control processors (opt.)**	2	2
Channels (std.)	16	16
Channels (opt.)	16	16
Channel speed (megabytes/second)	2	2
Optional TCCP with trunk configuration of	1 or 2 low; 1 low, 1 high	1 or 2 low; 1 low, 1 high
Low-speed trunk transfer rate (bytes per second)	50K	50K
High-speed trunk transfer rate with DMA (megabytes per second)	1.1	1.1
System control unit consoles (std.)	2	2
System control unit consoles (opt.)	2	2
Dual flexible disk units (for firmware, testware, and error logging)	Std.	Std.

*4 only beyond 8 megabytes.

**A maximum of 3 processors if TCCP is installed with very high-speed trunk.



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- ▷ The V-8600 processors can be conditioned to process statements written in a specific programming language through firmware control. In addition to the VRX and COBOL virtual machines in use on other V-model 8000 series processors, the V-8600 systems can be conditioned to operate as FORTRAN-77 virtual machines.

NCR states that purchase prices for typical V-8650 systems will range from \$2.4 to \$3.5 million, while typical V-8670 systems will range from \$3.8 to \$5.3 million. The new systems will be available beginning in the fourth quarter of 1980.

A new peripheral device available with the V-8600 computer family is the 6550 Dual Spindle Disk unit, which has a capacity of over 1 billion bytes of data (1036 megabytes) and a data transfer rate of 1.2 million bytes per second. The 6550 is manufactured by Magnetic Peripherals, the joint venture of CDC, Honeywell, and CII-Honeywell Bull. The new disk unit has twice the capacity of the largest disk unit previously offered by NCR. Average head positioning time is 25 milliseconds, and average rotational delay is 8.3 milliseconds. The 6550 employs 1024-byte sectors.

Other V-8600 peripherals include printers with speeds up to 2000 lines per minute and magnetic tape handlers with recording densities up to 6250 bits per inch and transfer rates up to 1.2 million bytes.

VRX RELEASE 2: Enhancements to NCR's VRX operating system in Release 2 are in the areas of communications, peripherals, and languages.

VRX RJE capability provides on-line communications between one or more remote terminals and the VRX operating system. Communications are handled through either dial-in or dedicated facilities and provide compatibility with NCR Century RBE, NCR Criterion RBE, NCR 399/499, NCR IMOS RBC, IBM 2780, and IBM HASP Multileaving. Operator commands and displays are used at the central site to provide overall control of the RJE environment.

Magnetic Tape Printer Output Spooling allows the spooling of a job's printed reports to a magnetic tape device under Job Control Language specifications. The spooled report may be retired to archives, transported to another system, or printed off-line by means of a utility.

Extended Disk Addressing (EDA) expands the capacity of the NCR 658 and 6590 disk units using either the Criterion Access Method (CAM) or NCS file technique.

Polled CRT Telecommunications enables NCR 796-301 and 796-501 asynchronous and synchronous CRT's to be supported in a polled environment using the Network Definition Language to identify the environment and to assist the software in optimizing link polling and in simplifying message formats. □

EQUIPMENT PRICES

		<u>Purchase Price</u>	<u>Annual Maint.</u>	<u>One-Year Rental</u>
I-8410 Interactive Processor System; includes a CRT console, I/O link controller for 6530 Disk Drives and printer attachment, and 5 communications lines with ICS light display.				
	Processor with 256K bytes of memory and:			
AU 8410-0001	81 megabytes of disk storage	\$ 80,000	\$ 3,050	\$ 2,120
AU 8410-0002	135 megabytes of disk storage	88,500	3,490	2,305
AU 8410-0003	162 megabytes of disk storage	92,500	3,710	2,397
AU 8410-0004	216 megabytes of disk storage	101,000	4,150	2,582
AU 8410-0005	242 megabytes of disk storage	105,000	4,370	2,674
AU 8410-0006	297 megabytes of disk storage	113,500	4,810	2,859
AU 8410-0007	324 megabytes of disk storage	117,500	5,030	2,951
	Processor with 512K bytes of memory and:			
AU 8410-0011	81 megabytes of disk storage	91,500	3,395	2,420
AU 8410-0012	135 megabytes of disk storage	100,000	3,838	2,605
AU 8410-0013	162 megabytes of disk storage	104,000	4,058	2,697
AU 8410-0014	216 megabytes of disk storage	112,500	4,498	2,882
AU 8410-0015	242 megabytes of disk storage	116,500	4,718	2,974
AU 8410-0016	297 megabytes of disk storage	125,000	5,158	3,159
AU 8410-0017	324 megabytes of disk storage	129,000	5,378	3,251
	Processor with 768K bytes of memory and:			
AU 8410-0021	81 megabytes of disk storage	103,000	3,746	2,720
AU 8410-0022	135 megabytes of disk storage	111,500	4,186	2,905
AU 8410-0023	162 megabytes of disk storage	115,500	4,406	2,997
AU 8410-0024	216 megabytes of disk storage	124,000	4,846	3,182
AU 8410-0025	242 megabytes of disk storage	128,000	5,066	3,274
AU 8410-0026	297 megabytes of disk storage	136,500	5,506	3,459
AU 8410-0027	324 megabytes of disk storage	140,500	5,726	3,551

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Processor with 1024K bytes of memory and:			
AU 8410-0031	114,500	4,094	3,020
AU 8410-0032	123,000	4,534	3,205
AU 8410-0033	127,000	4,754	3,297
AU 8410-0034	135,500	5,194	3,482
AU 8410-0035	139,500	5,414	3,574
AU 8410-0036	148,000	5,854	3,759
AU 8410-0037	152,000	6,074	3,851
8650 System; includes 4 megabytes of memory, 32K bytes of cache memory, 96K bytes of WCS (ISU), 2 channel control processors, 16 I/O channels, dual console, system control unit, motor generator set (maintains line current), and VRX Operating System	1,776,500	81,840	46,400
8670 System; includes 4 megabytes of memory, 128K bytes of cache memory, 192K bytes of WCS (ISU), 2 channel control processors, 16 I/O channels, dual console, system control unit, motor generator set (maintains line current), and VRX Operating System	2,555,000	96,000	62,900
I/O CONTROL AND PROCESSOR OPTIONS FOR I-8410			
AK 5520-P955	3,000	420	100
AK 5520-P956	3,000	420	100
AK 5520-P957	3,000	420	100
AK 5520-P959	—	—	—
AK 5520-P903	2,200	24	50
AK 5520-P198	12,000	240	300
AK 5530-P140	4,150	120	100
AK 5530-P141	9,300	264	225
I/O AND PROCESSOR OPTIONS FOR V-8600 SYSTEMS			
I/O Channel Expansion Unit; includes 8 I/O channels and channel processor	210,000	2,760	5,010
Trunk Channel Control Processor; for Century Series type peripherals; includes one low-speed trunk	18,850	1,080	500
Additional low-speed trunk	4,150	120	100
Very high-speed trunk	9,300	264	225
8650 Upgrade to 8670	778,500	—	—
Thermal Hard-Copy Printer on Console	3,700	240	100
Additional Dual Console	30,000	960	895
Additional Motor Generator	18,000	1,080	720
Motor Generator Cabinet	2,000	—	50
Printer Controller for 8600	2,000	144	70
600-cpm Card Reader	11,500	384	277
1000-cpm Card Reader	13,800	900	375
Reader Interface	1,150	60	30
Reader Controller	1,500	120	50
MEMORY			
256K-byte memory increment for 8410	11,500	345	300
First additional 2-megabyte memory increment for 8650	98,400	2,016	3,350
Second additional 2-megabyte memory increment for 8650	98,400	2,016	3,350
Additional 2-megabyte shared memory increment for 8670	98,400	2,016	3,350
Four-megabyte shared memory increment (required for all 8670 memories over 8 megabytes)	196,800	4,032	6,700
MASS STORAGE			
AU 6530-0301	16,000	960	485
AA 6531-0000	225	—	—
6550 Disk Unit (1,036 megabytes) for 8600	69,000	2,136	1,845
Disk Controller for 6550	14,300	1,140	395
VRX FORTRAN-77; for 8600	—	—	500

Multi-year rates follow NCR's standard discount policy.