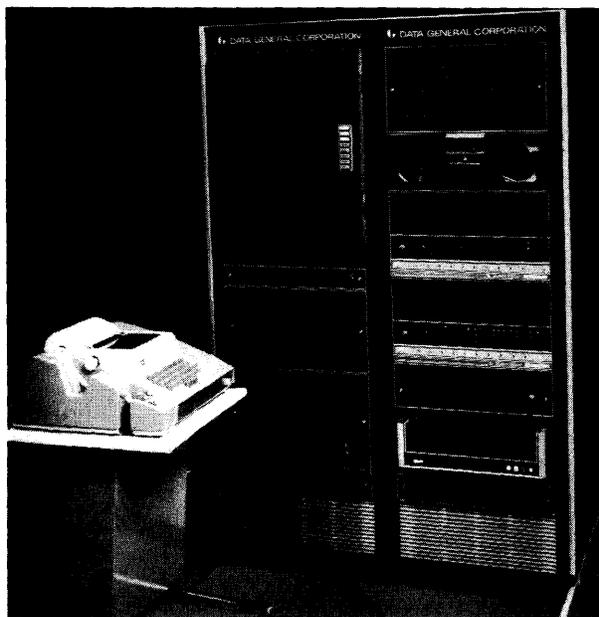# Data General Nova Series

The new Dual Nova, which uses Data General's Real-time Disc Operating System (RDOS), is said to be the first dual-processor/ shared-disc minicomputer available to users as a standard product. Three models are available, using a fixed-head Novadisc, a moving-head disc cartridge, or a disc pack drive. Prices start at $44,930 for a basic Dual Nova 2 (pictured), and range upward to $83,172 for a Dual Nova 840 sharing a 24.9-megabyte disc pack drive.

The numerous Novas, which comprise one of the most popular 16-bit minicomputer families, are marketed to OEMs and sophisticated end users. This dynamic family of minicomputer systems has elevated its maker, Data General Corporation, to the coveted "Number Two" position among minicomputer manufacturers.

MANAGEMENT SUMMARY

Data General's widely accepted Nova series has been somewhat reshaped by the October 1974 announcement of the new Eclipse series (see following report). For one thing, the Supernova and the original, basic Nova are no longer in production. Further, the 840 is no longer the most powerful Data General system. However, the remaining Novas at the low end of the series will continue to proliferate in those areas where low-cost OEM systems are in demand. Additionally, the Novas are the only Data General systems currently available with 4,096 words of memory. Nevertheless, Data General will not hesitate to replace the entire Nova series if the new Eclipse line takes off. This is particularly true because all Nova systems software and most user programs written for the Novas will run on Eclipse systems.

When the basic Nova minicomputer—forerunner of a family presently comprising 10 models—was introduced in September 1968, it was based upon a 16-bit word length at a time when most manufacturers were busily developing 12-bit machines (e.g., DEC's PDP-8 family). Less than a year later, Data General introduced the Supernova, a machine with more than three times the ▷

CHARACTERISTICS

MANUFACTURER: Data General Corporation, Southboro, Massachusetts 01772. Telephone (617) 485-9100.

MODELS: Nova 2/4, 2/10, 800, 820, 840, 1200, 1210, 1220.

DATA FORMATS

BASIC UNIT: 16-bit word. The processor can also handle eight-bit bytes.

FIXED-POINT OPERANDS: 16-bit operands can be interpreted as logical words, memory addresses, two eight-bit bytes, or as 16-bit signed or unsigned binary numbers.

FLOATING POINT OPERANDS: 32-bit single-precision operands with a seven-bit exponent and signed 24-bit fraction; and 64-bit double-precision operands with a seven-bit exponent and signed 56-bit fraction. All Nova processors can implement single and double-precision floating-point arithmetic through software subroutines. With the optional floating point unit (FPU), single- and double-precision arithmetic can be handled by hardware (not available on Nova 2/4).

INSTRUCTIONS: One-word instructions. There are four basic instruction types; each with different formats: Jump and Modify Memory, Move Data, I/O, and Arithmetic and Logic. In all instructions, bit positions 0-2 specify the instruction type.

In the Jump and Modify instructions, bits 3 and 4 identify the specific function (op code), and the rest of the word contains information used to calculate the effective address (8-bit displacement, two-bit index register specification, and one-bit indicator to specify direct or indirect addressing). In Move Data instructions, bits 3 and 4 address an accumulator, and the rest of the word is identical in structure to the Jump and Modify type above. For I/O instructions, bits 5-9 specify the function (indication of transfer direction, selection of an I/O device register and/or specification of an operation). Bits 3 and 4 select an accumulator for transfer, and bits 10-15 indicate a specific device. Arithmetic and Logic instructions use bits 1 and 2 to identify an accumulator containing a second operand (if present), bits 5-7 to specify primary function, and the rest of the word to specify secondary functions, if any. ▶

Data General Nova Series

▷ speed of the original Nova and with unusually strong processing capabilities for a minicomputer of that day. That machine subsequently was followed by the Supernova SC, the first commercial minicomputer to employ semiconductor main memory. The Supernova SC extended the upper limit of the Nova family to nearly seven times its original processor capability.

Also announced in October 1970, with the Supernova SC, were the Nova 1200 and Nova 800, using 1200-nanosecond and 800-nanosecond core memories, respectively. About a year later, the Models 1200 and 800 were, in turn, redefined by the 1210, 1220, 1230, and 820. The primary distinction between these models and the earlier 1200 and 800 systems lies in mechanical packaging that permits more economical production and assembly methods.

With the addition of the larger Model 840 (800 nanoseconds) in April 1973 and the low-priced Nova 2/4 and 2/10 (1 microsecond or 800 nanoseconds) in June 1973, Data General is currently focusing marketing attention on the 2/4 and 2/10 for orders of five or more units, and on the 840 system for heavier processing requirements. The Model 840 is the top of the current Nova line, with the largest main memory range among Novas and with processor speeds equal to the most demanding applications in the minicomputer arena.

The latest additions to the Nova line are the dual-processor configurations announced early in 1974. The Nova 840 and Nova 2/10 are both available in standard dual-processor, shared-disc system configurations, which are unique in the minicomputer industry as off-the-shelf items, according to Data General.

At present, therefore, Data General's Nova line comprises three sets: the low-cost Series 2, the high- ▷

▶ For all memory reference instructions, bits 5-15 are used to formulate the effective address, using bits 8-15 as the displacement (or direct address). Each instruction can address the 256 words in its vicinity directly, or can use either relative or base register addressing. No decimal instructions are available for any Nova family member.

INTERNAL CODE: ASCII, binary.

MAIN STORAGE

STORAGE TYPE: Magnetic core.

CYCLE TIME: 1.2 (1200 series), 1.0 (2 series), and 0.8 (800 series and 2 series) microseconds per word of core.

CAPACITY: 4K to 32K words of core memory, for most family members, in increments of 4K, 8K, or 16K words, except Model 840 which can have up to 128K words. (The 16K-word board is available in the 1.2-microsecond cycle time for the Nova 2 series only.) A read-only memory (ROM) of 256, 512, or 1,024 words is available for any Nova family member except the 840 and the 2 series.

CHECKING: None.

STORAGE PROTECTION: None of the Nova 2 or 1200 series. In the 800's, an optional memory allocation and protection (MAP) option is available to confine individual program access to an authorized area in main memory. The MAP option divides main memory into 4K-word segments, and can restrict access to 256-word pages. MAP is not supported by any standard DGC software, except by the Real-Time Disc Operating System.

A memory management and protection unit (MMPU) is available on the 840 for expanding memory to 128K words and protecting memory and restricting physical level I/O device access from user programs. The 840 MMPU divides main memory into 1K-word pages, and can protect individual pages through software support under the Real-Time Disc Operating System (RDOS).

CENTRAL PROCESSORS

GENERAL: The entire Nova family is organized around a single basic design with the processor, memory modules, ▶

SUMMARY DATA FOR NOVA MODELS

	Nova 2/4	Nova 2/10	Nova 800	Nova 820	Nova 840	Nova 1200	Nova 1210	Nova 1220
Announced	6/73	6/73	10/70	11/71	3/73	10/70	11/71	11/71
First Delivery	10/73	10/73	3/71	4/72	6/73	12/70	2/72	3/72
Basic Purchase Price*	$3,850	$4,750	$6,950	$6,450	$16,880**	$5,450	$4,350	$5,250
Relative Power	4.5	4.5	4.5	4.5	4.5	2.5	2.5	2.5
Available Chassis Slots	2	8	4	7	12	5	2	8
Number Installed	All models, over 12,000							

* All prices include I/O interface subassembly and TTY I/O interface, as well as CPU and 4K words of core memory.

**CPU plus 16K words of core memory and memory management and protection unit (MMPU).

Data General Nova Series

PERIPHERALS/TERMINALS

DEVICE	DESCRIPTION	SPEED
MAGNETIC TAPE UNITS		
6020/21/22/23	Industry-compatible, 75 ips; 7-track, 556/800 bpi } with control for 9-track, 800 bpi } up to 8 drives	60 KBS
4030K/L (Wang 812)	Industry-compatible, 12.5 ips; 7-track, 556/800 bpi (1 slot/control), 9-track, 800 bpi	10 KBS
4196A/B	Industry-compatible, 45 ips; 7-track, 1600 bpi 9-track, 1600 bpi	72 KBS
Nova Cassette	One-to-eight-drive subsystem, 30 ips, 50K words (1 slot/control)	800 words/sec.
LINE PRINTERS		
4034C (Centronics 101)	132-position, 64-character, ASCII (4014A interface)	165 cps
4034D	132-position, 64-character, ASCII (4014A interface)	165 cps
4034G	136-position, 64-character, ASCII (4014A interface)	300 lpm
4034H	136-position, 96-character, ASCII (4014A interface)	240 lpm
CARD EQUIPMENT		
4016C	Reader, 80-column (4036 interface)	150 cpm
4016D (Documation)	Reader, 80-column (4036 interface)	285 cpm
4016E (Documation)	Reader, 80-column (4036 interface)	400 cpm
4016F (Documation)	Reader, 80-column (4036 interface)	600 cpm
4016G (Documation)	Reader, 80-column (4036 interface)	1,000 cpm
4016H, I, J, K, L	Mark sense reader (4036 interface)	150, 285, 400, 600, or 1,000 cpm
PAPER TAPE EQUIPMENT		
6013	Reader, 8-channel (4007 interface)	400 cps
4012A (TTY BRPE-11)	Punch, 8-channel (4007 Interface)	63.3 cps
TERMINALS		
4010I	A/N CRT, 20 lines X 80 characters	to 2,400 bps
6010	A/N CRT, 24 lines X 80 characters	to 4,800 bps
6012	A/N CRT, 24 lines X 80 characters (buffered)	to 4,800 bps

▷ performance Series 800, and the intermediate Series 1200. Please review the Nova Series Summary Data Chart at left for a convenient recap of the current Nova models.

Although processor options and configuration rules vary among various members of the Nova family, all employ the same basic 16-bit architecture with four accumulators for computational use (two of which can be used ▷

► and communications/peripheral interfaces each contained on one or more individual 15-inch square boards. These boards plug into slots in the Nova chassis with its distinctive backplane wiring and power supply. In Models 820, 1210, 1220, and 2, the power supply is built into the back panel. Both models 1200 and 800 are optionally available in a "Jumbo" cabinet with space and power supplies for ten more board slots than the standard models. (See Configuration Rules below for available subassembly slots on all models.) ►

Data General Nova Series

for indexed registers), interchangeable core and read-only memory (except for the Nova 2 and 840), an I/O Bus, either a standard or high-speed Direct Memory Access (DMA) data channel, common 15-inch-square PC board packaging design, and strong communications capabilities. Most Nova systems can have both a core main memory and a semiconductor ROM. The actual number of devices that can be configured with any Nova system depends upon the number of available plug-in circuit board "slots" in the chassis.

The Nova family of minicomputers is generally used in control/monitoring systems, industrial testing, data acquisition/analysis, and various other scientific and educational applications, rather than in general business or accounting. The majority of Nova users are either OEM buyers or end users building their own control systems. The Nova 840, with its multiprogramming capability and high-level language processors, is moving strongly into the sophisticated end user market.

Independently packaged complete systems built upon Nova minicomputers include the following: point-of-sale systems manufactured by TRW Data Systems; the 15-terminal text editing (word processing) system from Index Systems, Inc.; the Designer I or II plotter/digitizer system from Computervision Corporation in Burlington, Mass.; message switching systems from Action Communications Systems; Laboratory Instrumentation systems from Syntex Analytical Instruments (X-Ray diffraction); and DigiLab's Interferometer.

Data General's own end user packaged systems include the Seminar series of educational systems, all supporting the BASIC language. The Seminar machines range from single-user BASIC systems to 32-user educational/administrative systems offering BASIC, FORTRAN 5, and ALGOL 60 support. Prices range from $6,100 to more than $84,000 for these systems. The Nova 840, in the largest of the Seminars, offers concurrent time-sharing and batch operations.

Data General does not produce a "ruggedized" Nova, but such versions are available from Rolm Corporation, of Cupertino, California.

INSTRUCTION TIMES

	Series 2		Series 800	Series 1200
	800 nsec.	1000 nsec.		
Load/Store	1.6	2.0	1.6	2.55
Add/Subtract	0.8	1.0	0.8	1.35
Multiply/Divide	5.5/5.8	5.6/5.9	8.8	3.75/4.05
Compare & Branch	1.1	2.1	1.0	2.7

Any Nova system can have either a full programmer's console or a lower-level on-off-type "turnkey" console.

In fully debugged, dedicated applications environments, the programmer console can be excluded completely and the Nova processor used as a hardwired controller with the turnkey console; program changes would be made by substitution of ROM boards. The turnkey console is an operator panel, rather than a true console with keyboard, signal lights, power on/off buttons, etc.

Processor options for all Nova models include power monitor/auto restart, hardware multiply/divide, and a real-time clock. The later attaches and operates like a peripheral device. In addition to the "standard" options, the 800 series has a memory allocation/protection option. Also, 2's, 1200's, and 800's can have an automatic program load option.

All models except the 2/10, 820, 1220, and 840 can be contained in a 5¼-inch high cabinet; the 800 and 1200 Jumbos, as well as the 2/10, 820, 1220, and 840 use the full-sized 10½-inch cabinet.

REGISTERS: Each Nova processor has four 16-bit accumulators and a 15-bit program counter (PC) register. The accumulators are used to hold operands for arithmetic and logical operations and two of them can be used as index registers. The PC register can also be used by applications programs as an index register for relative addressing of up to 256 words in the vicinity of the instruction (128 positions ahead or behind).

INDIRECT ADDRESSING: Standard, multi-level.

INSTRUCTION REPERTOIRE: All Novas have the same basic complement of four Jump and Modify Memory instructions, two Move Data instructions, 16 I/O instructions, and eight arithmetic and logic instructions. (There are 256 variations on each of the arithmetic and logic instructions.) Hardware multiply/divide instructions are available as options.

INSTRUCTION TIMINGS: The timings shown in the accompanying chart are for full-word, fixed-point operands in microseconds.

INTERRUPTS: A 16-level programmed priority interrupt facility is used to recognize interrupts for I/O operations. Each I/O device is wired to one of 16 bus positions, and is either authorized or denied authorization to interrupt particular service routines by an Interrupt Disable Mask Bit that corresponds to the bus position of the device.

PROCESSOR MODES: The 800 Series recognizes either a supervisor or user mode of program execution for use with the memory allocation and protection options. The executive program runs in the supervisor mode, and can write-protect portions of each user's memory area. With this option and operating in user mode, no user can write in a protected area, use more than two levels of indirect addressing, or issue I/O instructions. The memory management and protection unit on the Nova 840 also provides user (mapped) and supervisor (non-mapped) modes. In the user mode, logical memory addresses are mapped to physical addresses, memory can be write-protected, and I/O devices can be individually protected from physical access.

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DMA DATA CHANNEL RATES*

	Series 800	Series 1200	Series 2**
Standard in	500,000	833,333	476,190/ 434,782
Standard out	500,000	555,555	476,190/ 434,782
High-speed in	1,250,000	–	1,250,000/ 833,333
High-speed out	1,000,000	–	833,333/ 714,285
Standard increment	454,545	416,666	454,545/ 416,666
High-speed increment	833,333	–	769,230/ 666,666

* Expressed in words/second
**With 800 ns/1.0 us memories.

▷ Data General provides its own maintenance and field support services through about 50 Field Service Centers distributed worldwide, which employ approximately 200 service personnel. Two depot locations, Southboro, Massachusetts and El Segundo, California, provide comprehensive repair facilities.

Competition for Data General's Nova family comes from a number of other minicomputer builders, but the main source of competition is Digital Equipment Corporation's PDP-11 family of 16-bit minicomputers. Generally, both families are highly regarded in the industry, and until release of the Nova 2's, offered roughly comparable price performance. The Nova 2's, and their dramatic price cuts of about 40%, once again restated Data General's determination to keep improving the minicomputer industry's price/performance ratios. While DEC has far more systems of all types installed, Data General has delivered roughly as many 16-bit machines as DEC, and many users feel that Data General's Nova software support is somewhat more fully developed. (Please note that Data General's software is described in detail in Report M13-304-101.)

In any event, as the Number Two minicomputer vendor, Data General has fared well with the Novas, and is still in the process of expanding their peripheral equipment and software facilities.

USER REACTION

In Datapro's 1974 survey of minicomputer users, responses were received from 21 Data General users with a total of 88 installed Nova Series computers. Here's how they rated their Novas in nine important areas: ▷

▶ INPUT/OUTPUT CONTROL

INPUT/OUTPUT CHANNELS: An I/O bus and a Direct Memory Access (DMA) channel are standard on all Novas. Various high-speed options are available (see table). The DMA data channel provides a multiplexor-like capability and can be seized by any device through a data channel request to handle 16-bit data transfers to and from main memory. The DMA channel can be used to increment the contents of storage locations by "1."

SIMULTANEOUS OPERATIONS: Memory overlapping is provided on the Series 2 only.

CONFIGURATION RULES: Up to 62 peripheral devices can be attached to the I/O bus. The actual number of devices that can be attached to a particular Nova depends upon the available slots in the basic chassis and any available chassis extensions. The 2/10 has 10 slots (1 for the processor and 1 for a standard memory module); the 1200 has 7 slots (1 used for processor); the 1200 Jumbo has 17 slots (1 for processor); the 1210 or 2/4 has 4 slots (1 used for the processor and 1 for a standard core memory module); the 1220 has 10 slots (one used for processor and 1 for a standard core memory module); the 800 has 7 slots (2 used for the processor); the 800 Jumbo has 17 slots (2 for the processor); the 820 has 10 slots (2 for the processor, 1 for a standard memory module); and the 840 has 17 slots (2 for the processor, 2 for the basic memory modules, and 1 for the MMPU). Each memory module occupies one slot. The multiply/divide feature on the Nova 1200's requires one slot; the memory protection feature on the 800's requires one slot. The Memory Management and Protection Unit occupies one of the slots in an 840 chassis. Memory expansions of 7 slots are provided for the 1200 or the 800, 10 slots for the 1220 and 820, and 7 or 15 slots for the 840. Individual slot requirements for interfaces and communications terminals are shown in the Peripherals/Terminals table and Equipment Prices section.

MASS STORAGE

Note that all disc subsystems can be accessed by two controllers, facilitating the design of dual processor/ shared-disc systems. Dual-processor configurations are fully software-supported by Data General.)

FIXED-HEAD DISC SUBSYSTEMS: Consists of a 4019 Controller and a total on-line capacity of up to two million words. Novadiscs can hold 131,072, 262,144, 524,288 or 786,432 words. All of the fixed-head drives run at 3600 rpm, with an average access time of 8.4 milliseconds and an average data transfer rate of 57,835 words per second. Each disc is organized into tracks with 8 sectors per track and 256 words per sector. (A disc may have from 32 to 384 tracks.) Quarter- or half-unit drives have fewer heads, and therefore recognize fewer tracks. Under operator control, switches on the back of each drive can be manually set to provide write protection to any of 8 sets of 16 tracks. The 4019 Controller connects to the data channel on any Nova series system.

MOVING-HEAD DISC SUBSYSTEMS: These removable-disc subsystems consist of a 4046 Controller, an adapter for any of three types of disc drives, and up to four individual drives with a total on-line capacity of 49 million words. ▶

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	Excellent	Good	Fair	Poor	WA*
Overall performance	10	7	2	0	3.4
Ease of programming	1	10	6	1	2.6
Ease of operation	6	9	5	0	3.1
Hardware reliability	8	8	3	0	3.3
Maintenance service	0	10	8	1	2.5
Technical support	0	9	6	3	2.3
Operating systems	5	4	7	0	2.9
Compilers and assemblers	4	7	6	0	2.9
Applications programs	1	5	1	4	2.3

*Weighted Average on a scale of 4.0 for Excellent.

Thus, it's clear that Data General users are well pleased with the performance and reliability of their systems. And it's equally clear that Data General—like so many other minicomputer builders—has plenty of room for improvement in its technical support, maintenance service, and software.□

With the 4048 adapter, up to four 4048A drives (Century III) can be connected. Each six-high IBM 2311-type disc pack can hold 3,118,080 words, with data organized on each of ten recording surfaces into 200 tracks with six sectors, each containing one 256-word block. Average head positioning time is 36 milliseconds, average rotational delay is 12.5 milliseconds, and data transfer rate is 78K words/second.

With the 4057 adapter, up to four 4057A drives (Century 114) can be connected. Each 11-high IBM 2314-type disc pack can hold 12,472,320 words, with data organized on each of 20 recording surfaces into 200 tracks with 12 sectors, each containing one 256-word block. Average head positioning time is 35 milliseconds, average rotational delay is 12.5 milliseconds, and data transfer rate is 156K words/second.

With the 4047 adapter, up to two 4047A drives (Diablo 31) or one 4047B drive (Diablo 33) can be connected. Using the 4049 double-capacity adapter, four 4047A or two 4047B drives can be attached. The 4047A drive holds one removable 4047C disc cartridge. The 4047B drive consists of two cartridges, one fixed and one removable. They sit on separate spindles and can seek independently. The lower cartridge is never removed and is supplied with the system. Data is organized on each of two 4047C recording surfaces into 200 tracks with 12 sectors containing one 256-word block. Total storage capacity of each cartridge is 1,247,000 words. Average head positioning time is 70 milliseconds, average rotational delay is 20 milliseconds, and data transfer rate is 90K words/second.

INPUT/OUTPUT UNITS

See Peripherals/Terminals table.

COMMUNICATIONS CONTROL

4015 SYNCHRONOUS COMMUNICATIONS CONTROLLER: Provides full-duplex interface to the DMA data channel for a single high-speed line operating up to 50,000 bps. Two-, six-, seven-, or eight-bit characters of data are transferred in each memory cycle, and a modem control is included in the subsystem. Options are available for parity checking with each character, and an internal clock for use without a modem.

4023 ASYNCHRONOUS SINGLE LINE CONTROLLER: Provides full-duplex interface for a single Model 37ASR, 37KSR; 6010, 6012, 4010 I video display; or Bell System 103, or equivalent, with manual answer. Standard rate is 150 bps for 10- or 11-unit codes. (Other rates are optionally available.) The 4029 option adds modem control features for Bell System 202 units with Automatic Answer.

4025 IBM 360/370 PROGRAMMABLE INTERFACE: Attaches to a selector or Multiplexor channel, and can simulate the IBM 2803, 2700 series, etc. Operates in multiplexed or burst mode at up to 150,000 bytes/second. A 4025-IBM Software Driver is provided for I/O programming. The 4025 can operate with RDOS or RTOS in a real-time environment.

4026 PROGRAMMED ASYNCHRONOUS MULTIPLEXOR: Uses the Data Communications Multiplexor Handler (DCMH) software package to provide full-duplex interface for up to 16 EIA Standard level or 20-mil teletype lines per subsystem. Automatic answering is available as an option.

4038 MULTIPROCESSOR COMMUNICATIONS ADAPTER: Permits attachment of up to 15 Nova systems through their DMA data channels to a common communications bus. The common communications bus has a bandwidth of 500,000 words/second with typical data transfer rates of 140K words/second (Nova 1200) to 250K words/second.

4060 ASYNCHRONOUS MULTIPLEXOR: Provides interfaces for up to 64 lines (four lines per subassembly, up to 16 subassemblies) at speeds from 45 to 9600 bits/second with five- to eight-level codes.

4100 ASYNCHRONOUS MULTIPLEXOR: Provides interfaces for up to 128 asynchronous lines. Line speed and character size are programmable. Parity and modem control are optional. Communication interfaces reside in an external chassis accessible by two processors.

4073 SYNCHRONOUS/BISYNCHRONOUS LINE ADAPTER: Provides programmable interface to four half- or full-duplex synchronous data sets (201-type). A single-line adapter (4074) is also available. Up to sixteen 4073's can be attached for a maximum 64-line interface.

SOFTWARE

OPERATING SYSTEMS: Three levels of system control programming are available for various configurations of the Nova systems. Each of these includes an appropriate level of language processors and utility programs.

STAND-ALONE OPERATING SYSTEM: SOS is a subset of the Real-Time Disc Operating System that uses magnetic tape or cassette tape as a system residence to provide device-independent, buffered I/O service. SOS is upward compatible with RDOS, and provides Assembler support on an 8K system. With 12K words, Extended BASIC is supported. FORTRAN IV and ALGOL support requires 16K words.

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▶ REAL-TIME OPERATING SYSTEM: RTOS is an upward-compatible subset of the Real-Time Disc Operating System that runs in only 4K words of main memory to provide multitasking. Run-time support for Assembler and FORTRAN IV programs is available under RTOS.

REAL-TIME DISC OPERATING SYSTEM: RDOS is a full-scale multitasking system that runs in 16K words to support program development under Assembler and FORTRAN IV, and in 20K words for Extended BASIC and ALGOL. A substantially more powerful FORTRAN 5 language processor can be run on Novas with 32K words of Memory, 512K words of disc, a floating-point processor, hardware multiply/divide, and a magnetic tape unit.

A Batch Monitor spooling supplement is available for 16K Nova systems to handle I/O streams without operator intervention.

A mapped version of RDOS (MRDOS) is available on the 840 to support two-partition multiprogramming with the 31K-word user program areas and an operating system area of up to 31K words (typical size is 8K-12K words). RDOS also provides an extensive file management capability.

Also available are cross-assemblers for the IBM 360/370, CDC 6600, and Univac 1108, and time-shared BASIC for up to 16 simultaneous users. A single-user BASIC facility can be used on smaller configurations.

PROGRAMMING: The most often used Nova programming languages are FORTRAN IV and Extended Assembler. These languages are used with the two primary operating systems: RTOS and RDOS. A significantly more powerful FORTRAN 5 is available for use with larger Novas under RDOS. BASIC and FORTRAN IV languages include full standard specifications, and subsets and supersets of each are available. Also available are an IBM/2780 emulator, a commercial subroutine package, and a Sort/Merge program.

APPLICATIONS: Software consists of about 20 mathematical routines, more than two dozen CPU and peripheral device diagnostics, and a variety of language processor libraries, utility programs, format conversion routines, etc. For details, please turn to Report M13-304-101.

PRICING

POLICY: Data General provides the Nova family on a purchase-only basis, with two types of separately priced maintenance agreements: the On-call Service contract and the Factory Service contract, which involves return of faulty equipment to a designated repair location. In either case, all parts and labor are included at no additional cost. For non-contract on-site service, the maintenance rates range rom $25-$35 per hour depending upon shift and holiday hours.

Data General software is licensed so as to be included without charge on a system with sufficient Data General hardware to operate it. The software is available for purchase on other Data General configurations utilizing other than Data General equipment (e.g., peripherals, add-on memory, etc.).

Software prices range from $5 for object versions of various language processors to $1,000 for full source listings of FORTRAN or ALGOL library systems. Typical prices are $200 for single-user BASIC Source listing, and $600 for stand-alone FORTRAN IV compiler listing.

The Nova 2 series computers are available in quantities of five or more. Prices shown are for single-unit quantities, and standard OEM three-five quantity discounts of 19 percent apply. Discounts of about 40 percent are available for quantities of 10 or more units.

EQUIPMENT: The following typical system purchase prices include all required control units, adapters, and cables.

TYPICAL 1220 BATCH CONFIGURATION: Includes 8154 processor with 16K words of 1.2-microsecond core memory, 4010A Teletype console (10 cps), 6013 paper tape reader (400 cps), 4016D card reader (285 cpm), 4034A line printer (356 lpm), and one 4047A disc drive (1.2 million words), and rack. Purchase price is $40,550. With the addition of an 8020 high-performance floating-point unit, the price increases to $44,550.

TYPICAL 2/10 BATCH CONFIGURATION: Includes Nova 2/10 processor with 24K words of 1.0- and 0.8-microsecond core memory, 4010A Teletype console (10 cps), 6013 paper tape reader (300 cps), 4016D card reader (285 cpm), 8020 high-performance floating point unit, 8307 multiply/divide, 4034A line printer (356 lpm), one 4047A disc drive (1.2 million words), and rack. Purchase price is $46,150.

BASIC DUAL 2/10 CONFIGURATION: Includes two Nova 2/10 processors with 32K words of core memory each, two power monitors with auto restart, two automatic program loaders, two real-time clocks, a 6013 high-speed paper tape reader, a 4010I 20-line, 80-character video display, a 4047B moving-head disc drive (2.49 million words), a 4047C disc cartridge, a 4010A Teletype console (10 cps) and a 4119 2,400-baud oscillator. Purchase price is $57,100.

BASIC DUAL 840 CONFIGURATION: Includes two Nova 840 processors with 32K words of core memory each, two memory management and protection units, two power monitors with auto restart, two automatic program loaders, two real-time clocks, a 4119 2,400-baud oscillator, a 6013 high-speed paper tape reader, a 4010I 20-line, 80-character video display, a 4047B moving-head disc drive (2.49 million words), a 4047C disc cartridge, a 4030J magnetic tape transport, a 4010A Teletype console (10 cps), and the major portion of supplied software on magnetic tape. Purchase price is $87,300. ∎

Data General Nova Series

EQUIPMENT PRICES

| | | | Monthly Maintenance | |
	Purchase Price	On-Call Service	Factory Service

NOVA 2 CENTRAL PROCESSORS

8331	2/4 Processor with 4,096 words (2)**	$ 3,500***	$ 40	$ 20
8332	2/4 Processor with 8,192 words (2)**	4,000***	52	26
8333	2/4 Processor with 16,384 words (2)**	5,600***	64	32
8334	2/4 Processor with 24,576 words (1)**	7,600***	96	48
8335	2/4 Processor with 32,768 words (1)**	9,100***	108	54
8351	2/10 Processor with 4,096 words (8)**	4,400***	44	22
8352	2/10 Processor with 8,192 words (8)**	4,900***	56	28
8353	2/10 Processor with 16,384 words (8)**	6,500***	68	34
8354	2/10 Processor with 24,576 words (7)**	8,500***	100	50
8355	2/10 Processor with 32,768 words (7)**	10,000***	112	56

NOVA 2/10 RTOS PACKAGED SYSTEMS (including applicable software)

System A	2/10 Processor with 16K words in table-top enclosure, 8306 power monitor and auto restart, 4007 I/O interface subassembly, 4010 I/O interface, 4008 real-time clock, and a 4010A Teletype console.	10,900	102	—
System C	Same as System A, but with 32K words	14,400	146	—

NOVA 2/10 SOS PACKAGED SYSTEMS (including applicable software)

System A	2/10 Processor with 16K words, rack mountable, 4007 I/O interface subassembly, 4010 I/O interface, 4011 paper tape reader control, 6013 high-speed paper tape reader, 4012 paper tape punch control, 4010A Teletype console, and 4012A high-speed paper tape punch.	16,100	135	—
System B	Same as System A, but with 32K words	19,600	179	—

NOVA 2/10 RDOS PACKAGED SYSTEMS (including applicable software)

System A	2/10 Processor with 32K words, rack mountable, 4007 I/O interface subassembly, 4010 I/O interface, 4011 paper tape reader control, 6013 high-speed paper tape reader, 4046 moving-head disc control, 4047 moving-head disc adapter and power supply, five remaining slots in computer chassis, 4010A Teletype console, 4047A moving-head disc drive (1.24-million words), and 4047C disc cartridge.	27,350	257	—
System B	Same as System A, substituting a 4047B moving-head disc drive (2.49-million-word capacity).	30,350	287	—

DUAL NOVA 2/10 PACKAGED SYSTEM (includes applicable software)

	Two 2/10 Processors with 32K words of core storage each, rack mountable, two 8306 power monitors and auto restart, two 8308 automatic program loads, two 4007 I/O interface subassemblies, two 4008 real-time clocks, two 4010 I/O interfaces, 4119 oscillator for 2,400 baud, 4011 paper tape reader control, 6013 high-speed paper tape reader, two 4240 interprocessor busses, two 4046 moving-head disc controls, 4047 moving-head disc adapter and power supply, eight remaining slots in computer chassis, 4010I 20-line, 80-character video display, 4047B moving-head disc drive (2.49 million words), 4047C disc cartridge, 1012G 2-bay rack cabinet, 4010A Teletype console, and EC4047 moving-head disc adapter.	57,100	510	—

NOVA 2 MEMORIES (for field expansion only)

8300	4,096 words (800 nanosecond) core memory	2,000	20	10
8301	8,192 words (800 nanosecond) core memory	2,200	32	16
8302	16,384 words (1,000 nanosecond) core memory	3,500	44	22

NOVA 800 SERIES CENTRAL PROCESSORS

8230	Nova 800 processor with 4,096 words (4)**	6,600	53	27
8231	Nova 800 processor with 8,192 words (4)**	8,000	64	32
8232	Nova 800 processor with 16,384 words (3)**	11,200	99	50
8233	Nova 800 processor with 24,576 words (2)**	14,400	134	67
8235	Nova 800 Jumbo processor with 4,096 words (14)**	7,450	60	30
8236	Nova 800 Jumbo processor with 8,192 words (14)**	8,850	71	36
8237	Nova 800 Jumbo processor with 16,384 words (13)**	12,050	106	53
8238	Nova 800 Jumbo processor with 24,576 words (12)**	15,250	141	70
8239	Nova 800 Jumbo processor with 32,768 words (11)**	18,450	176	88
8253	Nova 820 processor with 4,096 words (7)**	6,100	63	32
8254	Nova 820 processor with 8,192 words (7)**	7,500	74	37
8284	Nova 820 processor with 16,384 words (6)**	10,700	109	56
8285	Nova 820 processor with 24,576 words (5)**	13,900	144	72
8286	Nova 820 processor with 32,768 words (4)**	17,100	179	90

*Slots required.
**Slots available.
***Unit price for minimum quantity of five units.

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EQUIPMENT PRICES

		Purchase Price	Monthly Maintenance On-Call Service	Monthly Maintenance Factory Service
NOVA 800 SERIES MEMORIES (for field expansion only) (Continued)				
8264	Nova 840 processor with 16,384 words (expansion to 64K memory in this chassis; (12)**	$ 16,530	$ 134	$ 67
8290	Nova 840 processor with 24,576 words (expansion to 64K memory in this chassis; 11)**	19,730	169	85
8291	Nova 840 processor with 32,768 words (expansion to 64K memory in this chassis; 10)**	22,930	204	102
8292	Nova 840 processor with 40,960 words (expansion to 64K memory in this chassis; 9)**	26,130	239	120
8293	Nova 840 processor with 49,152 words (expansion to 64K memory in this chassis; 8)**	29,330	274	137
8294	Nova 840 processor with 65,536 words (6)**	35,730	344	172
8295	Nova 840 processor with 81,920 words (expansion to 128K in this unit; 19)**	45,130	438	219
8296	Nova 840 processor with 98,304 words (expansion to 128K in this unit; 17)**	51,530	508	254
8297	Nova 840 processor with 131,072 words (13)**	64,330	648	324
8265	Nova 840 processor with 16,384 words (12)**	13,230	106	53
8298	Nova 840 processor with 24,576 words (11)**	16,430	141	71
8299	Nova 840 processor with 32,768 words (10)**	19,630	176	88
DUAL NOVA 840 PACKAGED SYSTEM (includes applicable software)				
	Two 840 processors with 32K words of core storage each, two memory management and protection units, two 8206 power monitors and auto restart, two 8208 auto program loads, two 4007 I/O interfaces, two 4008 real-time clocks, two 4010 Teletype/video display I/O interfaces, 2,400 baud oscillator, 6013 high-speed paper tape reader, two 4240 interprocessor busses, 4010I 20-line, 80-character video display, 4047B moving-head disc drive (2.49-million words), 4047C disc cartridge, 4030J magnetic tape transport, 4010A Teletype console, and the major portion of supplied software on magnetic tape.	87,300	784	—
NOVA 800 SERIES MEMORIES (for field expansion only)				
8268	4,096-word, 16-bit 800-nanosecond core memory (1 slot; not for 840)*	$ 2,500	$ 24	$ 12
8269	8,192-word, 16-bit 800-nanosecond core memory (1 slot)*	3,200	35	18
8226/8277	256-word, 16-bit semiconductor read-only memory (1 slot; not for 840)*	900	9	5
8227/8278	512-word, 16-bit semiconductor read-only memory (1 slot; not for 840)*	1,450	13	7
8228/8279	1024-word, 16-bit semiconductor read-only memory (1 slot; not for 840)*	1,950	20	10
NOVA 1200 SERIES CENTRAL PROCESSORS				
8182	Nova 1200 processor with 4,096 words (5)**	5,100	40	20
8183	Nova 1200 processor with 8,192 words (5)**	5,950	52	26
8184	Nova 1200 processor with 16,384 words (5)**	7,550	64	32
8185	Nova 1200 processor with 24,576 words (4)**	9,550	96	48
8186	Nova 1200 processor with 32,768 words (4)**	11,050	108	54
8187	Nova 1200 Jumbo processor with 4,096 words (15)**	5,950	44	22
8188	Nova 1200 Jumbo processor with 8,192 words (15)**	6,800	56	28
8189	Nova 1200 Jumbo processor with 16,384 words (15)**	8,400	68	34
8190	Nova 1200 Jumbo processor with 24,576 words (14)**	10,400	100	50
8191	Nova 1200 Jumbo processor with 32,768 words (14)**	11,900	112	56
8133	Nova 1210 processor with 4,096 words (2)**	4,000	40	20
8134	Nova 1210 processor with 8,192 words (2)**	5,400	59	30
8140	Nova 1210 processor with 16,384 words (2)**	7,000	71	36
8141	Nova 1210 processor with 24,576 words (1)**	9,000	103	52
8142	Nova 1210 processor with 32,768 words (1)**	10,500	115	58
8153	Nova 1220 processor with 4,096 words (8)**	4,900	44	22
8154	Nova 1220 processor with 8,192 words (8)**	6,300	56	28
8165	Nova 1220 processor with 16,384 words (8)**	7,900	68	34
8166	Nova 1220 processor with 24,576 words (7)**	9,900	100	50
8167	Nova 1220 processor with 32,768 words (7)**	11,400	112	56
NOVA 1200 SERIES MEMORIES (for field expansion only)				
8120	4,096-word, 16-bit, 1200-nanosecond core memory (1 slot)*	1,800	20	10
8121	8,192-word, 16-bit, 1200-nanosecond core memory (1 slot)*	2,000	32	16
8117	16,384-word, 16-bit, 1200-nanosecond core memory (1 slot)*	3,500	44	22
8126/8177	256-word, 16-bit semiconductor read-only memory (1 slot)*	750	8	4
8127/8178	512-word, 16-bit semiconductor read-only memory (1 slot)*	1,250	12	6
8128/8179	1024-word, 16-bit semiconductor read-only memory (1 slot)*	1,750	18	9
OPTIONS FOR ALL NOVA PROCESSORS				
4006/8106/ 8206/8306	Power Monitor and auto-restart. Causes program interrupt when power fails and automatic restart when power is restored (1 slot)*	400	1	1
8107/8307	Multiply/divide. Multiplies two 16-bit numbers to produce a 32-bit product. Divides one 32-bit dividend by a 16-bit divisor to produce a quotient and remainder. (Not for 800 series; 1 slot)*	1,600	13	7

*Slots required.
**Slots available.

Data General Nova Series

EQUIPMENT PRICES

		Purchase Price	Monthly Maintenance	
			On-Call Service	Factory Service

OPTIONS FOR ALL NOVA PROCESSORS (Continued)

		Purchase Price	On-Call Service	Factory Service
8207	Multiply/divide (like 8107, 8307 for 800 series; 1 slot)*	$ 1,000	$ 8	$ 4
8108/8208/ 8308	Automatic Program Load	400	2	1
8122/8222	External I/O cable connector. Brings I/O interface connections from the internal I/O bus to an external 50-pin connector (Not for 1210, 1220)	250	—	—
8124/8125/ 8224	Expansion chassis. Adds 7 I/O or Memory subassembly slots	1,850	10	5
8181/8281	Expansion chassis. Adds 10 I/O subassembly slots. (Not for 840)	1,850	10	5
8283	Expansion chassis. Adds 15 subassembly slots (8 for memory or I/O and 7 for I/O) for expansion to 128K words of main memory. (For 840 only)	3,000	24	12
8139/8309	Turnkey console for 5¼-inch chassis. Provides start, continue, reset, and program load keys for dedicated applications.	100	—	—
8159/8310	Turnkey console like 8139, 8309 for 10 ½-inch chassis	125	—	—
8020	Floating-point processor with industry-compatible 32- and 64-bit hexadecimal format. Fetches second operand from memory. (2 slots)*	4,000	32	16
8209/8021	Memory protection and allocation for 800 series. On 840 only, permits memory management for up to 128 K (1 slot)*	3,500	28	14

MASS STORAGE

		Purchase Price	On-Call Service	Factory Service
4019	Disc control for fixed-head disc drives. Data transfers through data channel facility. Controls up to 8 logical units. (1 slot)*	3,000	25	13
6001	Novadisc fixed-head disc drive, 131,072 words	5,200	45	23
6002	Novadisc fixed-head disc drive, 262,144 words	6,750	50	25
6003	Novadisc fixed-head disc drive, 524,288 words	9,250	60	30
6004	Novadisc fixed-head disc drive, 786,432 words	12,560	70	35
4046	Disc control for up to four moving-head disc pack or disc cartridge drives (1 slot)*	4,000	32	16
4047	Adapter and power supply for two 4047A or one 4047B disc drive	1,700	14	7
4049	Adapter and power supply for four 4047A or two 4047B disc drives	2,500	20	10
4047A	Disc drive, 1.247 million 16-bit words. Uses 4047C removable cartridge (not supplied)	5,000	50	25
4047B	Disc drive, 2.494 million 16-bit words. Fixed and removable discs. Fixed media supplied. Uses one 4047C removable cartridge (not supplied)	8,000	80	40
4047C	Disc cartridge, single two-surface disc, removable	200	—	—
4048	Adapter for up to four 4048A disc drives (for 4046)	6,000	48	24
4048A	Disc drive. Similar to IBM 2311. 3.118 million 16-bit words. Uses 4048B disc pack	11,000	120	60
4048B	Disc pack, 10-surface removable media (non-formatted)	350	—	—
4057	Adapter for up to four 4057A disc drives. (For 4046)	6,000	48	24
4057A	Disc drive. Similar to IBM 2314. 12.472 million 16-bit words. Uses 4057B disc pack (not for 4001 CPU)	12,000	150	75
4057B	Disc pack; 20-surface removable media (non-formatted)	500	—	—

MAGNETIC TAPE EQUIPMENT

		Purchase Price	On-Call Service	Factory Service
4030	Magnetic tape control. Controls up to 8 synchronous read-after-write 7- or 9-track tape transports (1 slot)*	4,000	25	13
4030I	Magnetic tape transport, 7-track, 45 ips, 556 or 800 bpi	5,900	65	33
4030J	Magnetic tape transport, 9-track, 45 ips, 800 bpi	5,900	65	33
4030K	Magnetic tape transport, 7-track, 12.5 ips, 556 or 800 bpi	4,250	50	25
4030L	Magnetic tape transport, 9-track, 12.5 ips, 800 bpi	4,250	50	25
4030M	Magnetic tape transport, 7-track, 75 ips, 556 or 800 bpi	8,500	90	45
4030N	Magnetic tape transport, 9-track, 75 ips, 800 bpi	8,500	90	45
4035	Magnetic tape adapter kit. Provides unit selection and adapts the Ampex TMZ, Wang 1175, Wang 1045, or PEC 6840 (9-track only) transports to tape control (4030)	1,700	—	—
4070	Magnetic tape adapter kit. Provides unit selection and adapts the Ampex TMX and TM16, and Wang 812 transports to tape control (4030)	1,700	—	—
4075	I/O interface subassembly. Must be ordered with cassette controller (1 slot)*	200	2	1
4076	Cassette I/O controller for up to eight read-after-write drives	1,500	12	6
4080	Chassis and three cassette drives for 1/8" tape, single channel, read-after-write	3,500	28	14
4081	Similar to 4080 except one drive	2,000	16	8
4084	Similar to 4080 except two drives	2,750	22	11
4082	Cassette for use with 4080, 4081, 4084	20	—	—

LINE PRINTERS/PLOTTERS

		Purchase Price	On-Call Service	Factory Service
4014	I/O interface subassembly. Must be ordered with incremental plotter control and/or line printer control (1 slot)*	200	2	1
4034	Line printer control	1,400	10	5
4034C	Serial 5 x 7 matrix printer; 165 cps; 10 characters per inch; up to 132 characters per line	4,500	40	20

*Slots required.
**Slots available.

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EQUIPMENT PRICES

LINE PRINTERS/PLOTTERS (Continued)		Purchase Price	Monthly Maintenance On-Call Service	Monthly Maintenance Factory Service
4034D	Serial 7 x 9 matrix printer; 165 cps; 10 characters per inch; up to 132 characters	$ 4,900	$ 40	$ 20
4034E	Optional stand for 4034C or 4034D to make TT unit free-standing	250	—	—
4034F	Optional stand for 4034A to make TT unit free-standing	200	—	—
4034G	Line printer, 300 lpm, 136 columns, 64-character ASCII	8,500	60	30
4034H	Line printer, 240 lpm, 136 columns, 96-character ASCII	10,500	65	33
4017	Incremental plotter control for all 4017 series plotters	1,500	10	5
4017A	Incremental plotter (drum) 12-inch paper, 0.01-inch, 0.005-inch or 0.1 mm step size, 300 increments/second	6,850	100	50
4017B	Same as 4017A but has slides for mounting in 19-inch rack	7,580	100	50
4017C	Incremental plotter (drum), 30-inch paper, 0.01 inch (200 increments/second), 0.005-inch or 0.01 mm (300 increments/second) step size	12,000	200	100
4017D	Incremental plotter (flatbed) 31 x 34-inch plot area, step size of 0.01 inch, 0.005 inch, 0.002 inch, 0.1 mm, or 0.05 mm (300 steps/second)	25,500	300	150
4017E	Incremental plotter (Z-fold paper). 11-inch paper, 0.01 inch, 0.005-inch, 0.25 mm, or 0.10 mm step size (300 steps/second)	5,000	100	50

PAPER TAPE EQUIPMENT

		Purchase Price	On-Call Service	Factory Service
4007	I/O interface subassembly. Must be ordered with paper tape reader control (4011), and/or paper tape punch control (4012) (1 slot)*	200	2	1
4011	Paper tape reader control for 6013, 4011B reader	850	7	4
6013	High-speed paper tape reader, 400 cps, fanfold, 8-channel tape	1,150	12	6
4012	Paper tape punch control for 4012A punch	700	6	3
4012A	High-speed paper tape punch, 63.3 cps fanfold, 8-channel paper tape	2,400	12	6
4013	Remote-operation modification to punch; allows power turn-on/turn-off under program control	300	2	1

PUNCHED CARD EQUIPMENT

		Purchase Price	On-Call Service	Factory Service
4036	I/O interface subassembly. Must be ordered with card reader control (4016). (1 slot)*	200	2	1
4016	Card reader control for 4016-type card readers	850	6	3
4016C	Low-speed punched card reader, 150 cpm	2,000	40	20
4016D	Medium-speed punched card reader, 285 cpm	2,900	40	20
4016E	Medium-speed punched card reader, 400 cpm	3,900	55	28
4016F	High-speed punched card reader, 600 cpm	4,100	80	40
4016G	High-speed punched card reader, 1000 cpm	5,000	80	40
4016H	Low-speed mark sense card reader, 150 cpm	2,800	40	20
4016I	Medium-speed mark sense card reader, 285 cpm	4,100	40	20
4016J	Medium-speed mark sense card reader, 400 cpm	6,000	55	28
4016K	High-speed mark sense card reader, 600 cpm	6,200	80	40
4016L	High-speed mark sense card reader, 1000 cpm	7,000	80	40

TERMINALS

		Purchase Price	On-Call Service	Factory Service
4007	I/O interface subassembly. Must be ordered with Teletype I/O interface (4010). (1 slot)*	200	2	1
4010	Teletype I/O interface for models 33ASR, 33KSR, 35ASR, and 35KSR	150	1	1
4009	Teletype modification kit. Converts models 33ASR TZ, TC, TU, or TER to on-line operation for use with 4010 control	100	—	—
4023	Voltage (EIA-type) I/O interface for model 37ASR and 37KSR Teletypes, 6010, 6012 or 4010I video displays	50	—	—
4069	Teletype modification kit. Converts model 33ASR TDT to function as a 4010E	100	—	—
4010A	Teletype model 33ASR 10 cps keyboard/printer; 10 cps 8-channel paper tape reader/punch	1,250	27	14
4010B	Teletype model 33KSR 10-cps keyboard/printer	1,350	24	12
4010C	Teletype model 34KSR 10-cps heavy-duty keyboard/printer	3,450	37	19
4010E	Teletype model 33ASR TDT 10-cps keyboard/printer; 10-cps 8-channel paper tape reader/punch with reader control (may also be used as 4010A). Normally used in time-sharing BASIC system using 4050 junction panel	1,900	30	15
4075	I/O interface subassembly. Must be ordered with Teletype I/O interface (4077) (1 slot)*	200	2	1
4077	Teletype I/O interface. Same as 4010 except uses same interface subassembly as cassette controller (4076)	150	1	1
4078	EIA-type interface. Same as 4023 except for use with 4077	50	—	—
6010	24-line, 80-character video display	2,300	20	10
6012	24-line, 80-character video display	2,700	25	13
4010I	20-line, 80-character video display (Infoton Vista Standard)	3,000	30	15

*Slots required.
**Slots available.

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EQUIPMENT PRICES

		Purchase Price	Monthly Maintenance	
			On-Call Service	Factory Service

ANALOG DATA CONVERSION SYSTEM

4120	A/D subsystem,single-channel, single-ended input. Includes programmed I/O interface, 10-bit A/D converter, sample and hold, analog I/O paddleboard with mating connector. (System conversion rate: 75KHz) (1 slot)*	$ 2,450	$ 30	$ 18
4121	Same as 4120 but 8-channel subsystem (1 slot)*	2,625	32	19
4122	Same as 4121 but 16-channel subsystem (1 slot)*	2,800	34	20
4123	Same as 4121 but 32-channel subsystem (1 slot)*	3,150	38	22
4130	A/D subsystem, single-channel differential input. Includes programmed I/O interface, 10-bit A/D converter, sample and hold analog I/O paddleboard and mating connector. (System conversion rate: 75KHz) (1 slot)*	2,650	32	19
4131	Same as 4130 but 4-channel subsystem (1 slot)*	2,825	34	20
4132	Same as 4130 but 8-channel subsystem (1 slot)*	3,000	36	21
4133	Same as 4130 but 16-channel subsystem (1 slot)*	3,350	40	23
4140	A/D subsystem, single-channel, single-ended input, includes programmed I/O interface, 12-bit A/D converter, sample and hold, analog I/O paddleboard with mating connector. (System conversion rate: 28KHz) (1 slot)*	2,600	32	19
4141	Same as 4140 but 8-channel subsystem (1 slot)*	2,775	34	20
4142	Same as 4140 but 16-channel subsystem (1 slot)*	2,950	36	21
4143	Same as 4140 but 32-channel subsystem (1 slot)*	3,300	40	23
4150	A/D subsystem, single-channel, differential input. Includes programmed I/O interface, 12-bit A/D converter, sample and hold, analog I/O paddleboard mating connector. (System conversion rate: 28KHz) (1 slot)*	2,800	33	19
4151	Same as 4150 but 4-channel subsystem (1 slot)*	2,975	35	20
4152	Same as 4150 but 8-channel subsystem (1 slot)*	3,150	37	21
4153	Same as 4150 but 16-channel subsystem (1 slot)*	3,500	41	23
4160	Extended A/D interface. Adds data channel operation	1,000	8	4
4161	Programmable gain option for single-ended systems	400	5	3
4162	Programmable gain option for differential systems	400	5	3
4180	Basic D/A interface and one 12-bit D/A converter. Requires some A/D subsystem	600	8	7
4181	Basic D/A interface and one 12-bit D/A converter. For use if no A/D subsystem. Includes analog I/O paddleboard and mating connector (1 slot)*	1,000	16	12
4182	Second 12-bit D/A converter	300	4	2
4183	Oscilloscope control	200	2	1

ANALOG-TO-DIGITAL CONVERSION

4014	I/O interface subassembly. Must be ordered with basic A/D interface (4032) (1 slot)*	200	2	1
4032	Basic A/D interface. Connects 4055 series converters and multiplexors to programmed I/O system	700	6	3
4033	A/D interface expansion. Adds data channel connections to 4032 interface	1,000	8	4
4055A	A/D, D/A chassis and power supply for an A/D converter with sample and hold and multiplexor with 32 single-ended or 16 differential channels, or 16 single-ended channels plus 2 D/A converters, or 8 D/A converters, or 8 differential channels plus 2 D/A converters	900	8	4
4055B	A/D, D/A chassis and power supply for an A/D converter with sample and hold and multiplexor for up to 64 single-ended or 32 differential channels and up to 8 D/A converters	1,200	11	6
4055C	A/D converter; 8 bits	450	5	3
4055D	A/D converter; 10 bits	600	8	4
4055E	A/D converter; 12 bits	750	10	5
4055F	A/D converter; 13 bits	950	12	6
4055G	A/D converter; 14 bits	1,200	15	8
4055H	A/D converter; 15 bits	3,200	40	20
4055I	Buffer amplifier, single-ended	200	3	2
4055J	Buffer amplifier, differential	400	5	3
4055K	Timing and control for multiplexor and sample and hold	230	4	2
4055L	Sample and hold	300	4	2
4055M	Multiplexor, 8-channel	160	2	1
4055N	Multiplexor, 16-channel (8-channel differential)	300	4	2
4055O	Enclosure, power supply, and decoding for 128 channel (64 differential) multiplexor expander	2,500	35	18
4055P	Enclosure and power supply for 64-channel (32 differential) simultaneous sample and hold expander	2,500	35	18
4055Q	Dual sample and hold	600	8	4
4014	I/O interface subassembly for basic wide-range A/D interface. (1 slot)*	200	2	1
4085A	Wide-range analog input system for up to 128 input channels, 13-bit A/D converter and sample rates up to 200 SPS using 4085E input cards and up to 100 SPS using 4085D input cards. Includes all required power supplies, programmable gain amplifier with gain control networks, channel address decode logic, analog-to-digital converter, and chassis wired to accept up to 16 eight-channel wide-range analog input relay cards. Does not include wide-range analog input relay cards (16)*	4,200	50	25

*Slots required.
**Slots available.

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EQUIPMENT PRICES

		Purchase Price	Monthly Maintenance	
			On-Call Service	Factory Service
ANALOG-TO-DIGITAL CONVERSION (Continued)				
4085B	Same as 4085A except 15-bit A/D converter and sample rates up to 40 SPS (33.3 SPS for 50Hz operation). (16)*	$ 4,200	$ 50	$ 25
4085C	128 channel expansion chassis for 4085A, B wide-range analog input system (3 maximum per 4085A, B). (16)*	1,500	20	10
4085D	Eight-channel analog input card for wide-range AIS 93 pole mercury-wetted contacts). Specify 4085A, B model. Mating connector with molded hood and cable clamping hardware included (1 slot)*	550	8	4
4085E	Eight-channel analog input card for wide-range AIS (3 pole dryreed contacts). Mating connector with moded hood and cable clamping hardware included. (1 slot)*	400	8	4
4085F	Eight single pole filters for 4085D, E	65	1	1
4085G	Eight double pole filters for 4085D, E	130	1	1
4085H	Programmable voltage calibrator for 4085A, B wide-range AIS.Provides eight program selectable calibrated input voltages (0.0V, 2mV, 8mV, 128mV, 512 mV, 2.048V, 8.192V) for on-line calibration of wide-range AIS. (Occupies one 8-channel card slot.)	1,350	30	15
4085I	Open transducer detect option	460	5	3
4085J	Automatic gain ranging and open tranducer detect option	900	8	4
4085K	Extender card for 4085D, E	130	—	—
4085L	Extender cable (2 feet) for 4085D, E	450	—	—
4085N	Spare input connector for 4085D, E	16	—	—
4085O	Input termination barrier strip for 4085D, E	100	—	—
DIGITAL-TO-ANALOG CONVERSION				
4036	I/O interface subassembly. Must be ordered with D/A converter control (4037) (1 slot)*	200	2	1
4037	D/A converter control, connects 4056 series converters and amplifiers to programmed I/O system	300	3	2
4053	Oscilloscope control for storage and nonstorage scopes	200	2	1
4055A	A/D, D/A chassis and power supply for an A/D converter with sample and hold and multiplexor with 32 single-ended or 16 differential channels, or 16 single-ended channels plus 2 D/A converters, or 8 D/A converters, or 8 differential channels plus 2 D/A converters	900	8	4
4055B	Same as 4055A for up to 64 single-ended or 32 differential channels and up to 8 D/A converters	1,200	11	6
4056A	Timing and control for all D/A converters in a chassis	350	5	3
4056B	D/A converters; 8 bits	250	3	2
4056C	D/A converters; 10 bits	275	3	2
4056D	D/A converters; 12 bits	300	4	2
4056E	D/A converters; 13 bits	625	8	4
4056F	D/A converters; 14 bits	720	9	5
4056H	Enclosure, power supply, and decoding for up to 24 D/A converters	2,600	35	18
DIGITAL I/O				
4065	I/O interface subassembly. Must be ordered with digital I/O interface (4066) and/or either eight external interrupts (4067) or programmable interval timer Options 4067 and 4068 can not both be on the same board (1 slot)*	200	2	1
4191	I/O interface subassembly. Same as 4065 but includes 4192 connector (1 slot)*	400	2	1
4066	Digital I/O interface. Provides 16 input lines, 16 output lines, one external interrupt, and one external strobe pulse. Signal levels are TTL-compatible Normally used with 4192 connector (not supplied)	300	3	2
4067	Eight external interrupts. Provides eight external interrupt inputs. Signal levels are TTL-compatible. May share connector with 4066	400	4	2
4192	General-purpose I/O or Digital I/O external connector. Normally used with 4040 or 4065 and 4066 or 4067	300	—	—
4068	Programmable interval timer provides a crystal-controlled oscillator with jumper selectable frequencies (10KHz, 40KHz, 80KHz, 180KHz, external) plus a 16-bit counting register which may be loaded and read under program control. Provides a program interrupt when the register is counted to zero	600	6	3
COMMUNICATIONS — ASYNCHRONOUS				
4007	I/O interface subassembly. Must be ordered with Teletype I/O interface (4010) (1 slot)*	200	2	1
4010	Teletype I/O interface for models 33ASR, 33KSR, 35ASR and 35KSR	150	1	1
4023	Voltage (EIA-type) I/O interface for model 37ASR and 37KSR. Teletypes, 6010, 6012, 4010I video displays and for Bell System 103 data set or equivalent when manual answer only is used. 150 baud	50	—	—
4029	Voltage (EIA-type) interface for Bell System 202 data set or equivalent (1200 baud), or 103 data set or equivalent (150 baud)	200	2	1
4119	Precision crystal oscillator for nonstandard frequencies for 4023 or 4029 options	50	—	—
4075	I/O interface subassembly. Must be ordered with Teletype I/O interface (4077). (1 slot)*	200	2	1
4077	Teletype I/O interface. Same as 4010 except uses same interface subassembly as cassette controller (4076)	150	1	1
4078	EIA-type interface. Same as 4023 except for use with 4077. May wish 1017A, B or 1049G cables	50	—	—

*Slots required.
**Slots available.

Data General Nova Series

EQUIPMENT PRICES

COMMUNICATIONS — ASYNCHRONOUS (Continued)		Purchase Price	Monthly Maintenance	
			On-Call Service	Factory Service
4026	Sixteen-line asynchronous multiplexor. Controls up to four 4027 or 4028 interfaces. (1 slot)*	$1,000	$ 8	$ 4
4027	Interface for four EIA standard level lines. Used with Bell 103 or equivalent data sets. Includes four EIA level inputs in addition to data input	350	3	2
4028	Interface to four 20 mA Teletypes (less than 100 feet)	300	3	2
4060	Four-line subsystem of 64-line maximum asynchronous multiplexor with hardware character assembly, disassembly, and buffering. Full duplex operation with transmission code characteristics and line speed selectable by jumpers; programmed I/O interface. Provided for use with 20 mA local Teletypes (1 slot)*	1,500	13	7
4061	Same as 4060 except wired for use with 4050 or 4083 junction panels (1 slot)*	1,500	13	7
4062	Same as 4060 except provides EIA interface (1 slot)*	1,500	13	7
4063	Same as 4062 except EIA interface is wired for use with 4083 or 4051 junction panels (1 slot)*	1,500	13	7
4064	Precision crystal oscillator for nonstandard frequencies	50	—	—
4100	Data controller. Provides character assembly, disassembly and buffering for 64 lines of 1024 line system. Requires line interface modules 4102, 4104, and/or 4105 (1 slot)*	3,500	32	16
4112	Option subassembly, includes extended diagnostic capability and mounting for 4101, 4109, 4110, and 4111 (1 slot)*	200	2	1
4101	Modem control for up to 1024 lines including HDX/FDX and auto-answer	1,500	12	6
4109	Parity option for lines 0-255 on MAC	1,500	12	6
4110	Parity option for lines 256-511	1,500	12	6
4111	Parity option for lines 512-1023	3,000	24	12
4104	Line interface card for four 20 mA TTY lines (requires 1 slot in 4106 chassis)	350	3	2
4105	Line interface card for four EIA lines without modem control (requires 1 slot in 4106 chassis)	400	4	2
4102	Line interface card for two EIA lines with modem control (requires 1 slot in 4106 chassis)	400	4	2
4106	Communications chassis with 31 slots for options 4102, 4104, 4105, 4103, and/or 4108. Requires at least one 4103; includes one 4114 power supply.	1,650	10	5
4114	Power supply for 4106 communication chassis	1,000	10	5
4113	Power supply chassis to hold three 4114 power supplies	200	—	—
4103	Computer-to-chassis bus drop terminal. (Requires 1 slot in 4106 chassis)	400	4	2
4108	Communication chassis-to-chassis bus drop terminal (requires 1 slot in 4106 chassis)	400	4	2

COMMUNICATIONS — SYNCHRONOUS

4015	High-speed communications controller for high-speed full-duplex or half-duplex synchronous data sets (Bell 201 or equivalent). Automatic line synchronization, word assembly and end-of-transmission recognition. All data transfers are through the data channel. Accommodates character widths from 5 to 8 bits. (1 slot)*	2,250	20	10
4020	Internal clock option for 4015 high-speed communications controller	175	2	1
4021	Parity option for 4015 high-speed communications controller	250	2	1
4074	Synchronous line adapter subsystem with hardware character assembly, disassembly and buffering. Transmission code characteristics selectable by program; programmed I/O interface. Includes modem control (1 slot)*	1,200	10	5
4073	Synchronous line adapter subsystem. Four-line subsystem of 64-line maximum synchronous/bisynchronous multiplexor with hardware character assembly, disassembly, and buffering. Transmission code characteristics selectable by programmed I/O interface (1 slot)*	2,500	20	10

INTER-COMPUTER INTERFACES

4025	Programmable interface to any model 360/370 that has standard selector or multiplexor channels. Capable of supporting multiple devices simultaneously. User supplies driver software for channel interface and sufficient 360/370 computer time for installation and verification of correct operation. Price does not include installation (2 slots)*	5,000	100	50
4038	Multiprocessor communications adapter. Up to 15 Nova-line central processors may be interconnected with one 4038 adapter for each central processor (1 slot)*	2,100	17	9
4039F	Multiprocessor adapter cable, 10 feet long, for interconnecting two 4038 adapters	125	—	—
4240	Interprocessor bus unit for synchronization and communication between two Nova systems	1,900	17	9

REAL-TIME CLOCKS

4007	I/O interface subassembly. Must be ordered with real-time clock (4008) (1 slot)*	200	2	1
4008	Real-time clock. Four frequencies selectable under program control: line frequency, 10Hz, 100Hz, or 1000Hz	400	3	2
4079	Real-time clock. Same as 4008 except uses same I/O interface subassembly as cassette controller (4076)	400	3	2
4075	I/O interface subassembly. Must be ordered with real-time clock (4079) (1 slot)*	200	2	1
4068	Programmable interval timer provides a crystal-controlled oscillator with jumper selectable frequencies (10KHz, 40KHz, 80KHz, 160KHz, external) plus a 16-bit counting register which may be loaded and read under program control	600	6	3
4065	I/O interface subassembly. Must be ordered with programmable interval timer (4068). Options 4067 and 4068 cannot both be on the same board (1 slot)*	200	2	1

*Slots required.
**Slots available.

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