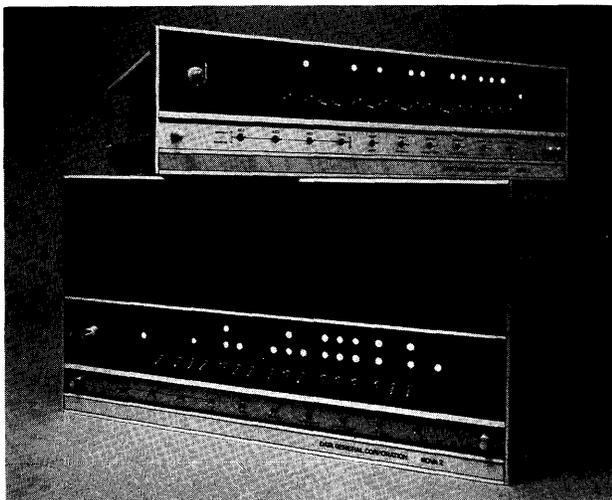# Data General Nova Series

Data General Corporation's recently announced minicomputers, the Nova 2/4, top, and the Nova 2/10, provide a wide range of performance capabilities and memory capacities. The Nova 2/4 holds four standard Data General printed circuit boards, while the Nova 2/10 holds 10 boards. The prices of the new computers range from $3,850 for a Nova 2/4 with 4,096 words of memory to $10,150 for a Nova 2/10 with 32,768 words of memory.

MANAGEMENT SUMMARY

When the basic Nova minicomputer — forerunner of a family presently comprising 12 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 speed of the original Nova, and with unusually strong processing capability for a minicomputer of that day. The Supernova also pioneered the use of overlapped instruction fetch/execution for minicomputer systems. 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 newer models and the earlier 1200 and 800 systems lies in mechanical packaging that permits more economical production and assembly methods.

With the recent addition of the larger Model 840 (800 nanoseconds) in April 1973, and the low-priced Nova 2/4 ▷

The myriad Novas, the most popular and widely sold 16-bit minicomputer family in the world, are marketed primarily to OEM or highly sophisticated end-users with in-house electronic instrumentation capability. This vital family of systems has raised its maker, Data General, to the "Number 2" position among minicomputer vendors.

CHARACTERISTICS

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

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

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's 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 types 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.

For all memory reference instructions, bits 5-15 are used to formulate the effectiveness 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. ▶

Data General Nova Series

▷ 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 OEM orders of five or more systems; and the 840 system for heavier processing requirements. Significantly less emphasis is now being put upon the Supernova and Supernova SC, as well as the 820 and the entire 1200 series. In fact, the Model 840 (not the Supernova SC), is the top of the current Nova line with the largest main memory range and sufficient processor speed to handle most applications (though not actually as hefty as the Supernova SC for raw number crunching speed).

(Please review the Nova Series Summary Data Chart below for a convenient recap of the many 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 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, and the Supernova SC can also have a cache-type 300-nanosecond semiconductor read-write memory. 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 applications. The majority of Nova users are either ▷

▶ INTERNAL CODE: ASCII, binary.

MAIN STORAGE

STORAGE TYPE: Magnetic core or bipolar semiconductor (Supernova Only).

CYCLE TIME: 2.6 (original Nova), 1.2 (1200 series), 1.0 (2 series) and 0.8 (800 series, 2 series, and Supernovas) microseconds per word for core; 300 nanoseconds for bipolar (Supernovas).

CAPACITY: 1K-32K words of core memory for most family members in increments of 1K, 2K, 4K, 8K, or 16K words, except Model 840 with up to 128K words. (The 16K board is available in the 1.2-microsecond cycle time for the Nova 2's only.) For the Supernovas, any combination of up to 32K words of core and bipolar semiconductor memory is possible, with bipolar memory available in increments of 256, 512, and 1,024 words. A read-only-memory (ROM) of 256, 512, or 1,024 words is also available for any Nova family member except the 840 and Nova 2.

CHECKING: None.

STORAGE PROTECTION: None on the Nova, Nova 2's, or 1200 series. In the 800's and Supernovas, 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 standard DGC software.

A memory management and protection unit (MMPU) is available on the 840 for expanding memory to 128K 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.

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	Nova 2/4	Nova 2/10	Nova 800	Nova 820	Nova 840	Nova 1200	Nova 1210	Nova 1220	Nova 1230	Super-Nova	Super-Nova SC
Announced	9/68	6/73	6/73	10/70	11/71	3/73	10/70	11/71	11/71	12/71	8/69	10/70
First Delivery	2/69	10/73	10/73	3/71	4/72	6/73	12/70	2/72	3/72	12/71	5/70	6/71
Basic Purchase $	$7,950	$3,850	$4,750	$6,950	$6,450	$16,500†	$5,450	$4,350	$5,250	$71,00**	$9,600	$14,200***
Relative Power	1	4.5	4.5	4.5	4.5	4.5	2.5	2.5	2.5	2.5	4.5	7.0
Avail. Chassis slots	4	2	8	4	7	12	5	2	8	14	3	3
Number Installed	925	—	—	485	170	—	2500	1540		200	210	

Note that the 800 and 1200 "Jumbo" models were released in April 1971 as low-cost expansions of the basic systems.

*CPU plus 4K words of core memory.
**CPU plus 8K words of core memory.
***CPU plus 3K words of core memory and 1K words of semiconductor memory.
†CPU plus 16K words of core memory and memory management and protection unit (MMPU).

SEPTEMBER 1973

Data General Nova Series

PERIPHERALS/TERMINALS

DEVICE	DESCRIPTION	SPEED
MAGNETIC TAPE UNITS		
4030I/J (Wang 1045)	Industry-compatible, 45 ips, 7-track 556/800 bpi (1 slot/control), 9-track, 800 bpi	36 KBS
4030K/L (Wang 812)	Industry-compatible, 12.5 ips, 7-track, 556/800 bpi (1 slot/control), 9-track, 800 bpi	10 KBS
4030M/N (Wang 1075)	Industry-compatible, 75 ips 7-track, 556/800 bpi (1 slot/control), 9-track, 800 bpi	60 KBS
Nova Cassette	One-to-eight-drive subsystem, 30 ips, 50K words (1 slot/control)	800 words/sec.
LINE PRINTERS		
4034B (Data Products 2410)	132-position, 64-character, ASCII (4014A interface)	245 lpm
4034C (Centronics 101)	132-position, 64-character, ASCII (4014 interface)	165 cps
CARD EQUIPMENT		
4016D (Documation)	Reader, 80-col. (4036 interface)	285 cpm
4016F (Documation)	Reader, 80-col. (4036 interface)	600 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		
6010	A/N CRT 24 lines X 80 characters	to 4800 bps
6012	A/N CRT 24 lines X 80 characters (buffered)	to 4800 bps

▷ OEM buyers or end-users building their own control systems. Data General's exposure to small, unsophisticated users has been slight. The Nova 840, with its multiprogramming capability and high-level language processors, is moving strongly into the end-user market.

Among the end-user, independently packaged complete systems that are built upon Nova minicomputers are the following: point-of-sale systems manufactured by TRW Data Systems; the 32-station Entrex 480 key-to-disk data entry system (using the Supernova); 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 Dataprep control tape preparation system for numeri- ▷

▶ 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, and 1220, and 2, the power supply is built into the back panel. Both models 1200 and 800 have a "Jumbo" version 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.)

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, ▶

Data General Nova Series

▷ cally controlled dual-axis machine tools ($5,950 to $7,450); Contour 1 computer numerical control system for 3-axis machine tools ($17,000 to $25,300); and the 10-member 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 $8,500 to more than $100,000 for these systems. The Nova 840 in the largest of the Seminar's offers concurrent time-sharing and batch operations.

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

Data General provides its own maintenance and field support services through about forty Field Service Centers distributed worldwide, and which employ approximately 100 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 broad range of industry sources, 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%) have once again restated Data General's determination to keep pushing the minicomputer industry's price/performance ratios. On the other hand, while DEC has far more systems of all types installed, Data General has more 16-bit machines, and many users find that Data General's Nova software support is somewhat more fully developed.

Users contacted by Datapro rated the Nova Series from good to excellent. In particular, the systems are known for their high speeds and low costs. On the other hand, the general-purpose Nova instruction set is not ideal for specialized process control applications. ▷

▶ the 800 series and the Supernovas have a memory allocation/protection option. Also, 2's, 1200's, and 800's can have an automatic program load option (standard on the Supernovas).

All models except the 2/10, 820, 1220, 1230, and 840 can be contained in a 5¼-inch high cabinet; the 800 and 1200 Jumbos, as well as the expanded Supernovas and the 2/10, 820, 1220, 1230, and 840 use the full-sixed 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, 26 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 and Supernovas recognize 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. ▶

INSTRUCTION TIMES

	Basic Nova	Series 2		Series 800	Series 1200	Supernova	
		800 nsec	1000 nsec			Core	Bipolar (SC)
Load/Store	5.25/5.5	1.6	2.0	1.6	2.55	1.6	1.2
Add/Subtract	5.9	0.8	1.0	0.8	1.35	0.8	0.3
Multiply/Divide	11.1/11.9	5.5/5.8	5.7/6.0	8.8	3.75/4.05	3.8/6.9	3.7/6.8
Compare & Branch	5.9	1.1	2.1	1.0	2.7	1.6	0.6

Data General Nova Series

DMA DATA CHANNEL RATES*

	Basic Nova	Series 800	Series 1200	Supernovas	Series 2**
Standard In	285,500	500,000	833,333	454,700	476,190/434,782
Standard Out	227,500	500,000	555,555	357,100	476,190/434,782
High-Speed In	–	1,250,000	–	1,250,000	1,250,000/833,333
High-Speed Out	–	1,000,000	–	1,000,000	833,333/714,285
Standard Increment	227,500	454,545	416,666	357,100	454,545/416,666
Hi-Speed Increment	–	833,333	–	833,333	769,230/666,666

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

▷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 and software capability. ☐

► INPUT/OUTPUT CONTROL: 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"; and on the original Nova or a Supernova, a word can be added to the contents of a memory location.

SIMULTANEOUS OPERATIONS: For Supernovas with semiconductor memory, overlapped instruction execution and memory access are standard. Memory overlapping is provided on the Series 2.

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 basic Nova has seven slots (two used for processor); the 2/10 has ten slots (one for the processor and one for a standard memory module); the 1200 has seven slots (one used for processor); the 1200 Jumbo has 17 slots (one for processor); the 1210 or 2/4 has four slots (one used for the processor and one for a standard core memory module); the 1220 has ten slots (one used for processor and one for a standard core memory module); the 800 has seven slots (two used for the processor); the 800 Jumbo has 17 slots (two for the processor); the 820 has ten slots (two for the processor, one for a standard memory module); the Supernovas have seven slots (three for the processor); and the 840 has 17 slots (two for the processor, two for the basic memory modules, and one for the MMPU). Each memory module occupies one slot. The multiply/divide feature on the Nova or Nova 1200's requires one slot; the memory protection feature on the 800's or Supernovas requires one slot; and the Supernova's high-speed data channel requires one slot. The Memory Management and Protection Unit occupies one of the slots in an 840 chassis. Memory expansions of four and seven slots are provided for the Supernovas; seven slots for the Nova, 1200's, or the 800; and ten slots for the 2's, 1220's and 820, and ten or 15 slots for the 840. Individual slot requirements for interfaces and communications termi-

nals 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. Either Novadiscs or Alpha Data 4019-type discs can be used. 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 eight sectors per track, and 256 words per section (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 eight sets of sixteen 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.

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 twenty 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. The 4057-type drives cannot be used with the original Nova System. ►

Data General Nova Series

▶ 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 twelve sectors containing one 256-word block. Total storage capacity of each cartridge is 1,288,000 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 CONTROL-LER: Provides full-duplex interface for a single high-speed line up to 50,000 bps to the DMA data channel. Two five-eight-bit characters (one word) 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 asnwer. 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 of 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 MULTIPLEX-OR: 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 ADAPT-ER: 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 (Supernova with Hi-Speed DMA option).

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 1024 asynchronous lines. Line speed and character size is programmable. Parity and modem control are optional. Communication interfaces reside in an external chassis accessible by up to four processors.

4073 SYNCHRONOUS/BISYNCHRONOUS LINE ADAPT-ER: 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, and FORTRAN IV, support on an 8K system. With 12K words, ALGOL 60 and Extended BASIC are also supported.

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 FOR-TRAN IV programs is available under RTOS.

REAL-TIME DISC OPERATING SYSTEM: RDOS is a full-scale, multitasking system that runs in 12K words to support program development under Assembler, FORTRAN IV, ALGOL 60, or Extended BASIC (up to 32 users). A more powerful FORTRAN 5 language processor can be run on Nova 800 or 1200 Jumbo with 28K 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 32K 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 recently released for use with larger Novas under RDOS is likely to become the most popular Nova programming system. BASIC and FORTRAN IV languages include full standard specifications, and both subsets and supersets of each are available.

APPLICATIONS: The primary application program available from DGC is Dataprep – a tape-preparation system for a two-axis numerical control system. Contour 1, a 2½-axis computer numerical control (CNC) system that governs the operation of machine tools such as lathes, milling machines, etc., is also available. Other 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. ▶

Data General Nova Series

PRICING

POLICY: Data General provides the Nova family on a pur-
chase-only basis, with two types of separately priced main-
tenance 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 from
$25-$35 per hour depending upon shift and holiday hours.
DGC software is licensed so that it is included without
charge on a system with sufficient hardware to operate it.
On other configurations it is available for purchase.

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; $600 for stand-
alone FORTRAN IV compiler listing; and $75 for Dataprep
source tapes. One-time installation Dataprep charges are
made at standard maintenance rates. Through direct agree-
ment with Rental Electronics Incorporated (REI) – a
Pepsico subsidiary – Nova systems can be obtained under
either one- to three-year lease agreements, or on monthly
rental terms. REI actually purchases the system and installs
it in the user account.

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

EQUIPMENT: The following typical systems' purchase
prices include all required control units and adapters.

TYPICAL 1220 BATCH CONFIGURATION: Includes
8154 processor with 16K words of 1.2 microsecond core
memory, 4010A teletype console (ten cps), 6013 paper
tape reader (400 cps), 4016D card reader (285 cpm),
4034D line printer (165 cps), and a 4074A disc drive (1.2
million words), and rack. Purchase price is $36,450.

TYPICAL 820 EXTENDED BASIC SYSTEM FOR 16
USERS: Includes 8254 processor with 32K words of
0.8-microsecond core memory, real-time clock, 4010A
teletype (ten cps), 6013 paper tape reader, 6002 fixed head
Novadisc (256K) for swapping, 404-A cartridge disc drive
(1.2 million words), dual Nova-cassette, 16 line asynchro-
nous multiplexor (for terminals) and racks. Terminals are
not included. Purchase price is $59,650.

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 (10cps), 6013 paper
tape reader (300 cps), 4016D card reader (285 cpm),
4034D Line Printer (165 cps) and a 4047A Disc drive (1.2
million words) and rack. Purchase price is $34,800.

TYPICAL 820 COMMUNICATIONS FRONT END CON-
FIGURATION: Includes 8254 processor with 16K words
of 0.8 microsecond memory, 4010A teletype (10 cps),
real-time clock, IBM 360/270 channel interface, four-line
subsystem of 64-line asynchronous multiplexor (4060)
four-line subsystem of 64-line synchronous multiplexor
(4073), and rack. Purchase price is $23,900.

TYPICAL LARGE-SCALE 840 CONFIGURATION: This
configuration will support Time Sharing (BASIC Language)
and BATCH operations (FORTRAN, ALGOL, Assembler)
concurrently. Includes 8264 processor with memory man-
agement and protection and 65K of 0.8 microsecond core,
real-time clock, multiply/divide, floating point hardware,
two 6010 CRT control consoles, 6013 paper tape reader,
6002 Novadisc (256K), 4057A type, 12.2 million word disc
pack, 9-track tape drive (60KB), 4016D card reader (285
cpm), 4034B line printer (245 lpm), and 16 line multi-
plexor for terminals (4060 series) and racks. Purchase price
is $129,080. ■

EQUIPMENT PRICES

| | | | Monthly Maint. | |
		Purchase Price	On-Call Service	Factory Service
NOVA* CENTRAL PROCESSOR				
4001	Basic original Nova processor (5)**	$3,950	$34	$17
NOVA* MEMORIES				
4003	4,096-word, 16-bit, 2600 nanosecond core memory (1 slot)***	3,650	28	14
4004	2,048-word, 16-bit, 2600 nanosecond core memory (1 slot)***	2,700	20	10
8016	8,192-word, 16-bit, 2600 nanosecond core memory (1 slot)***	4,100	32	16
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)**	8,900	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)**	9,800	112	56
NOVA 2 MEMORIES (For Field Expansion Only)				
8300	4,096-word, 16-bit, 800-nanosecond core memory (1 slot)	2,000	20	10
8301	8-192-word, 16-bit 800-nanosecond core memory (1 slot)	2,200	32	16
8302	16,384-word, 16-bit 1000-nanosecond core memory (1 slot)	3,500	44	22

*The original Nova.
**Slots available.
***Slots required.

Data General Nova Series

EQUIPMENT PRICES

			Monthly Maint.	
		Purchase Price	On-Call Service	Factory Service
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-w0rds (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
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
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, 1,200-nanosecond core memory (1 slot)**	1,800	20	10
8121	8,192-word, 16-bit, 1,200-nanosecond core memory (1 slot)**	2,000	32	16
8117	16,384-word, 16-bit, 1,200-nanosecond core memory (1 slot)**	3,500	44	22
8127, 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
SUPER NOVA CENTRAL PROCESSOR				
8001	Supernova processor (4)*	5,600	54	27
SUPER NOVA MEMORIES				
8003	4096-word, 16-bit 800 nanosecond core memory (1 slot)**	3,650	30	15
8015	8192-word, 16 bit 800 nanosecond core memory (1 slot)**	4,900	40	20
8077	256-word, 16-bit 300 nanosecond semiconductor read-only memory (1 slot)**	1,000	10	5
8078	512-word, 16-bit 300 nanosecond semiconductor read-only memory (1 slot)**	1,550	14	7
8079	1024-word, 16-bit 300 nanosecond semiconductor read-only memory (1 slot)*	2,050	21	11
8012	1024-word, 16-bit 300 nanosecond semiconductor read/write memory (1 slot)**	2,800	28	14
8013	512-word, 16-bit 300 nanosecond semiconductor read/write memory (1 slot)**	2,200	22	11
8014	256-word, 16-bit 300 nanosecond semiconductor read/write memory (1 slot)**	1,500	15	8

*Slots available.
**Slots required.

NOVEMBER 1973

Data General Nova Series

EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	
			On-Call Service	Factory Service
OPTIONS FOR ALL NOVA PROCESSORS				
4006, 8006, 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 original Nova or 800 series; 1 slot)*	1,600	13	7
4031	Multiply/divide (like 8107, 8307-for Original Noval only; 1 slot)*	2,000	16	8
8207	Multiply/divide (like 8107, 8307 for 800 series; 1 slot)*	1,000	8	4
8108, 8208, 8308	Automatic Program Load (not for Original Nova or Supernova)	400	2	1
4022, 8022, 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, or Supernova)	250	—	—
4024, 8024, 8124, 8125, 8224	Expansion chassis. Add 7 I/O or Memory subassembly slots.	1,850	10	5
8181, 8281	Expansion Chassis. Adds 10 I/O subassembly slots. (Not for Original Nava, 840, or Supernova)	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
8025	Expansion chassis. Adds 4 subassembly slots for memory. (For Supernova only)	1,850	10	5
8139, 8309	Turnkey console for 5 ¼-inch chassis. Provides start, continue, reset, and program load keys for dedicated applications (Not for Original Nova or Supernova)	100	—	—
8159, 8310	Turnkey console like 8139, 8309 for 10 ½-inch chassis. (Not for Original Nova or Supernova)	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
8008, 8209, 8021	Memory protection and allocation for 800 series and Supernova. On 840 only, permits memory management for up to 128 K (1 slot)*	3,500	28	14
8009	High-speed data channel for Supernova only. Uses the same interface as the standard data channel. Allows I/O device/memory transfers at up to 1.25 million 16-bit words/second for input and 1.0 million 16-bit words/second for output, add-to-memory, and increment. Interference for a single transfer is generally 800 nonoseconds. Maximum latency time is 4.2 microseconds. (1 slot)*	950	9	5
MASS STORAGE				
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
4019A	Fixed head disc drive, 65,536 words	4,250	40	20
4019B	Fixed head disc drive, 131,072 words	5,250	45	23
4019C	Fixed head disc drive, 262,144 words	6,750	50	25
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, 4046	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/CPU	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				
4030	Magnetic tape control. Controls up to 8 synchronous read after write 7- or 9-track tape transports (1 slot)*	4,000	25	13
40301	Magnetic tape transport, 7-track, 45 ips, 556 or 800 bpi	5,900	65	33
403J	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/CPU	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

*Slots required.

Data General Nova Series

EQUIPMENT PRICES

| | | | Monthly Maint. | |
		Purchase Price	On-Call Service	Factory Service
MAGNETIC TAPE EQUIPMENT				
4076	Cassette I/O controller for up to 8 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				
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
4034A	Line printer, 356 lpm, 80 columns, 64-character ASCII.	11,500	45	23
4034B	Line printer, 245 lpm, 132 columns, 64-character ASCII.	16,000	50	25
4034C	Serial 5 x 7 matrix printer; 165 cps; 10 characters per inch; up to 132 characters per line.	4,500	40	20
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	—	—
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				
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
4011B	High-speed paper tape reader, 300 cps, fanfold, 8-channel tape	1,800	13	7
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	1,500	12	6
4013	Remote-operation modification to punch; allows power turn-on, turn-off under program control	300	2	1
PUNCHED CARD EQUIPMENT				
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
4016A	Medium-speed card reader, 225 cpm	3,000	40	20
4016B	Medium-speed card reader, 400 cpm	3,000	55	28
4018C	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				
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	975	24	12
4010C	Teletype model 34KSR 10 cps heavy duty keyboard/printer	2,725	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	1,400	30	15
4023A	Teletype mode 37ASR; 15 cps keyboard/printer (upper and lower); 15 cps 8-channel paper tape reader/punch	5,250	55	28
4023B	Teletype model 37KSR; 15 cps keyboard/printer (upper and lower case)	3,750	45	23
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	—	—

*Slots required.

NOVEMBER 1973

Data General Nova Series

EQUIPMENT PRICES

		Purchase Price	Monthly Maint. On-Call Service	Monthly Maint. Factory Service
TERMINALS				
6010	24-line, 80-character video display.	$ 2,300	$20/mo.	$10/mo.
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
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)*	2,875	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
4094	I/O interface subassembly for basic wide-range A/D interface. (1 slot)*	200	2	1
4085	Basic wide-range A/D interface. Connects 4085A, B to programmed I/O.	700	6	3
4086	Extended wide-range A/D interface. Adds data channel connections to 4085 interface.	1,000	8	4
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.

Data General Nova Series

EQUIPMENT PRICES

	Purchase Price	Monthly Maint. On-Call Service	Monthly Maint. Factory Service

ANALOG-TO-DIGITAL CONVERSION

		Purchase Price	On-Call Service	Factory Service
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, 512mV, 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 transducer 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	100	–	–
4085O	Input termination barrier strip for 4085D, E	100	–	–

DIGITAL-TO-ANALOG CONVERSION

		Purchase Price	On-Call Service	Factory Service
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

		Purchase Price	On-Call Service	Factory Service
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, 160KHZ, 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

		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
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	–	–
4026	Sixteen-line asynchronous multiplexor. Controls up to four 4027 or 4028 interfaces. (1 slot)*	1,000	8	4

*Slots required.

NOVEMBER 1973

Data General Nova Series

EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	
			On-Call Service	Factory Service

COMMUNICATIONS — ASYNCHRONOUS

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)*			
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)			
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 or 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 program; 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 fifteen Nova-line central processors may be interconnected with one 4038 adapter for each central processor. (1 slot)*	2,100	17	9
4039A	Multiprocessor adapter cable, 10 feet long, for interconnecting two 4038 adapters.	125	—	—

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 whichm ay 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 can not both be on the same board. (1 slot)*	200	2	1

COMPUTER NUMERICAL CONTROL (CONTOUR 1)

4090	Linear/circular interpolator. Provides 2 axes of interpolation with variable feed rate control. (1 slot)*	2,500	20	20
4091	Programmable distance counters for output to interpolation on three axes. (1 slot)*	2,500	20	10
4092	Operator's console allows direct manual input to systems including feed rate override and x, y, z jog. Provides visual display of coordinate information. (1 slot)*	3,900	28	14

*Slots required.