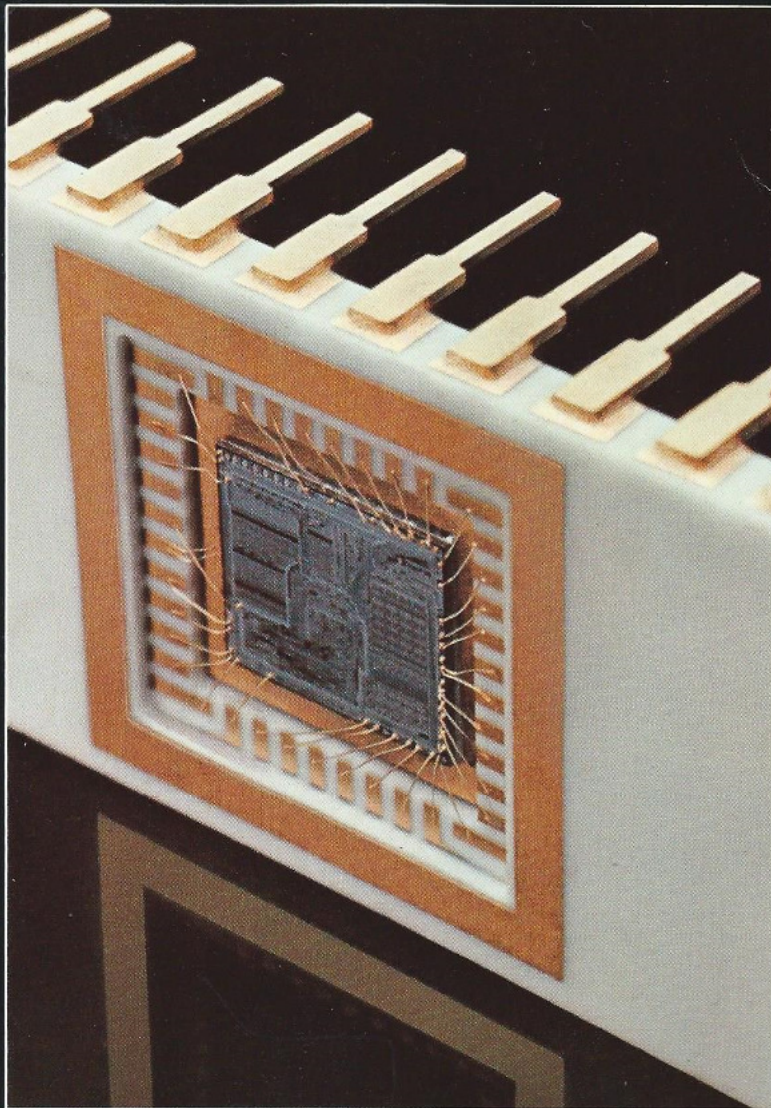


 Data General

microNOVA

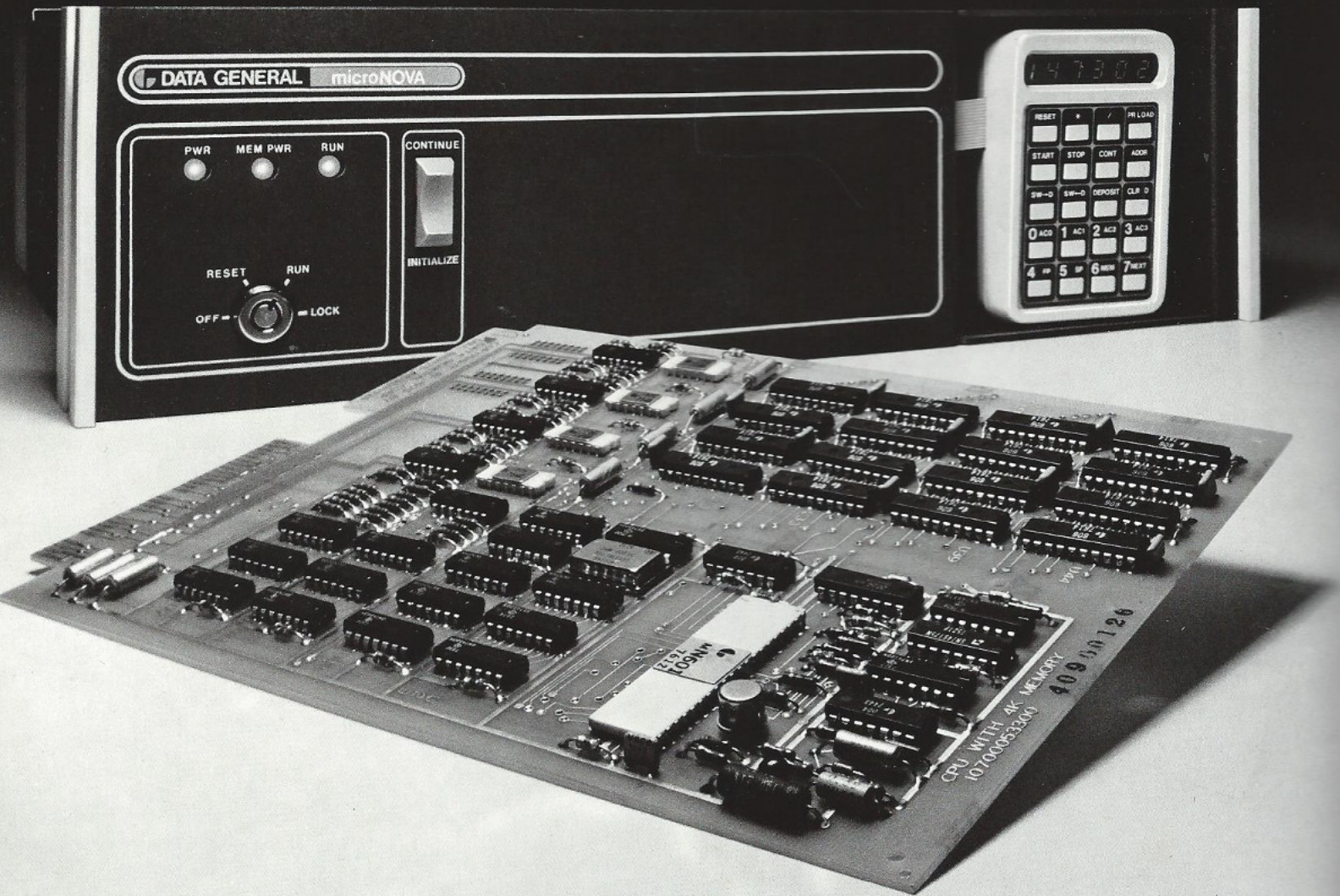


**CALL ANY OF THESE LOCATIONS FOR INSTANT DELIVERY:**

Westbury, N.Y: 516-334-7474 ■ Somerset, N.J: 201-469-6008 ■ Danbury, Conn: 203-792-3500  
Rochester, N.Y: 716-461-4000 ■ Waltham, Mass: 617-890-8484 ■ Rockville, Md: 301-881-2970  
Raleigh, N.C: 919-832-8881 ■ Atlanta, Ga: 404-449-9170 ■ Hollywood, Fla: 305-927-0511  
Beachwood, Ohio: 216-464-2970 ■ Chicago, Ill: 312-593-2740 ■ Detroit, Mich: 313-583-9242  
Edina, Minn: 612-941-5280 ■ Costa Mesa, Ca: 714-556-3880 ■ Costa Mesa, Ca: 213-924-5594  
Austin, Texas: 512-837-2890 ■ Dallas, Texas: 214-661-5010 ■ Houston, Texas: 713-784-3600  
Toronto, Canada: 416-678-9050 ■ Tel Aviv, Israel: 44 2219 ■ Telex 62627

  
**SCHWEBER  
ELECTRONICS**

Data General's microNOVA family puts 16-bit NOVA architecture into a microprocessor, a computer-on-a-board, and an MOS mini-computer, to give OEMs a complete packaging range.



# microNOVA: Micros That Are Really NOVA Computers

microNOVA is a high performance, state-of-the-art microprocessor-based family with 16-bit NOVA® computer capabilities. It's available as a chip, a chip set, a board, and a fully-packaged MOS minicomputer.

## **microNOVA: NOVA CPU On A Chip**

The microNOVA mN601 microprocessor is a NOVA CPU in a single 40-pin ceramic package. 16-bit data paths and multiple-register architecture provide data precision and efficient storage of intermediate results. A powerful instruction set reduces program storage requirements and simplifies coding. Multiple addressing modes provide full 32K-word addressing and maximum programming flexibility. Hardware stacks efficiently handle interrupts and subroutine linkage. Data General's advanced N-channel, silicon gate MOS circuit technology provides execution speeds fast enough for demanding real-time requirements.

## **microNOVA: NOVA Computer In A Chip Set**

The mN601 CPU is supported by the mN606 4096-bit Random Access Memory (RAM), the mN603 I/O Controller (IOC) circuit, and System Buffer Elements (SBEs). The 4096-bit mN606 uses cost-effective dynamic RAM technology to support microNOVA's large memory orientation. The mN603 IOC delivers the full functional capability of NOVA's 47-line I/O bus, and incorporates controller functions that simplify interfacing. System Buffer Elements let microNOVA support up to 32K words of memory and a full complement of peripherals.

## **microNOVA: NOVA Computer On A Board**

The microNOVA computer-on-a-board is a complete microcomputer on a 7½" x 9½" board, with CPU, 2K/4K words of dynamic RAM, and system buffering. Memory comes in 4K RAM, 8K RAM, ½K PROM, 1K PROM, 2K PROM, and 4K PROM versions. Data General peripherals include diskette and asynchronous terminal subsystems. General-purpose interface boards are available for custom design. A power supply, back-

plane/card frame, extender board, PROM burner, and remote programmer's console are available for added configurability.

## **microNOVA: NOVA Computer In An MOS Mini**

The microNOVA minicomputer is a compact 9- or 18-slot unit that includes CPU, 4K words of dynamic RAM, system buffering, and power supply. It's a true minicomputer with higher performance than many bipolar machines. It holds up to 32K words of RAM/PROM, and operates with a diskette subsystem and a terminal printer or video display subsystem, with ample room for expansion.

## **microNOVA: Micros With NOVA Software**

The microNOVA family uses NOVA computer development and runtime software proven in over 35,000 installations around the world. The diskette-based Disc Operating System (DOS) is part of Data General's Real-time Disc Operating System (RDOS) family. It supports NOVA computer utilities like an enhanced editor, MACRO Assembler, relocatable loader, and symbolic debugger, and brings real-time FORTRAN IV and DOS BASIC to the micro market. Runtime software includes Data General's proven Real-Time Operating System, and libraries for arithmetic subroutines, character handling, and I/O.

## **microNOVA: Micros That Are Really NOVA Computers**

Architecture. Performance. Software. Configurability. Support. Everything you've come to expect in a NOVA computer is now available for the first time in a micro family. microNOVA. Micros that are really NOVA computers.

# microNOVA: NOVA CPU On A Chip

The microNOVA mN601 CPU is a silicon-gate NMOS microprocessor that packs NOVA 16-bit multiple-register architecture into a single 192 mil x 181 mil chip.

## 16-bit NOVA Architecture

The mN601 incorporates NOVA 16-bit architecture in registers, internal data paths, and computational elements. The resulting compact instruction code means memory savings. Programming is also simplified for greater programmer productivity. Software is easier to debug, document, and maintain, for greater product flexibility. And products get implemented sooner too, for lower front-end investments and earlier revenue flow.

**Multi-Function Instruction Set.** Single-word instructions move data between random memory locations and any register. Other single-word instructions can execute arithmetic or logical operations from any pair of registers, and also shift, test, and store the resulting quantity. Hardware multiply and divide instructions are a standard part of the microNOVA instruction repertoire.

**Multiple Addressing Modes.** The microNOVA CPU uses a variety of addressing modes, including absolute, relative, indexed, deferred, and auto-increment/decrement. All with a single-word, bit-efficient instruction format that minimizes memory use.

**Hardware System Stack.** The microNOVA CPU uses NOVA 3's powerful hardware system stack which has separate stack and frame pointer registers for rapid context switching and re-entrant programming. A SAVE instruction allocates a new stack frame while simultaneously storing all central processor registers. Stack limit protection is maintained in hardware, with automatic traps on stack violation.

## Not Just A Chip.

### A Microprocessor System.

The microNOVA family was designed from the start as a total microprocessor system, for maximum performance, function, and economy. This approach was possible only because of Data General's strong position as a company that combines semiconductor technology and computer systems experience. The result: optimized distribution of system function in memory, I/O, and buffers.

**Separate Memory and I/O Busses.** The microNOVA memory and I/O busses are separate, each optimized to perform fundamentally different jobs. The memory bus has a high bandwidth 16-bit parallel implementation to maximize program execution throughput. The I/O bus has a differentially-driven serial implementation for high noise immunity, easy cabling, and a hundred foot length.

**Integrated I/O System Design.** The unique microNOVA serialized I/O encoding scheme overcomes pin and power limitations to maintain the NOVA computer's 47-line functionality. A 16-megabit data rate provides high performance. An "intelligent" I/O Controller (IOC) at each device presents an easy-to-use parallel interface.

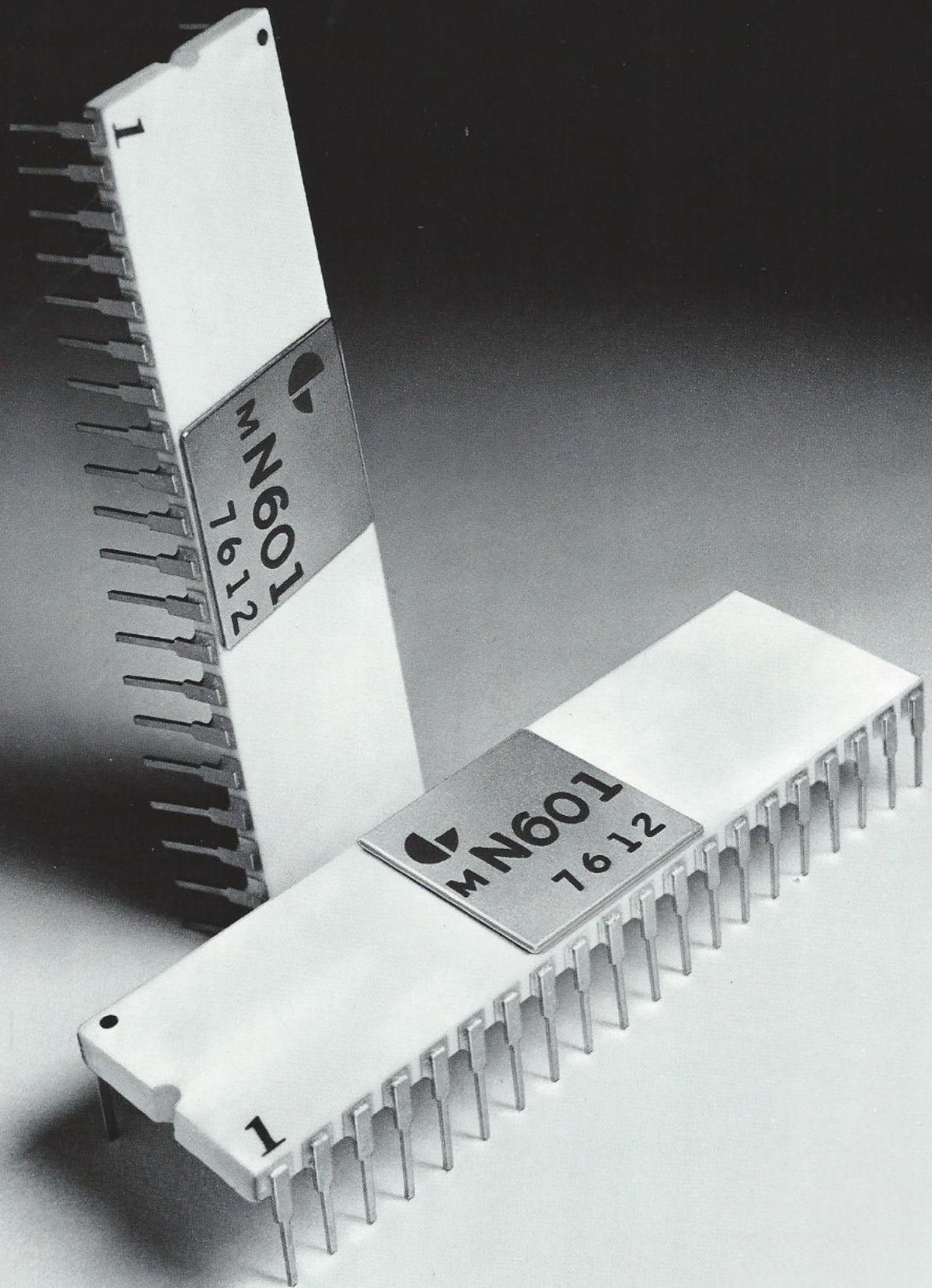
**Integrated Memory System Design.** The microNOVA family uses dynamic 4K RAM technology to complement its big-system orientation. Memory refresh circuitry is on the CPU chip, reducing chip count. And a unique "hidden refresh" scheme overlaps refresh with instruction execution.

**Integrated Buffering Approach.** High-density System Buffer Elements support the microNOVA family's big-system orientation. They provide full expandability, high performance, and noise immunity, while their high-density packaging minimizes chip count.

### microNOVA Instruction Execution Times ( $\mu$ sec.)

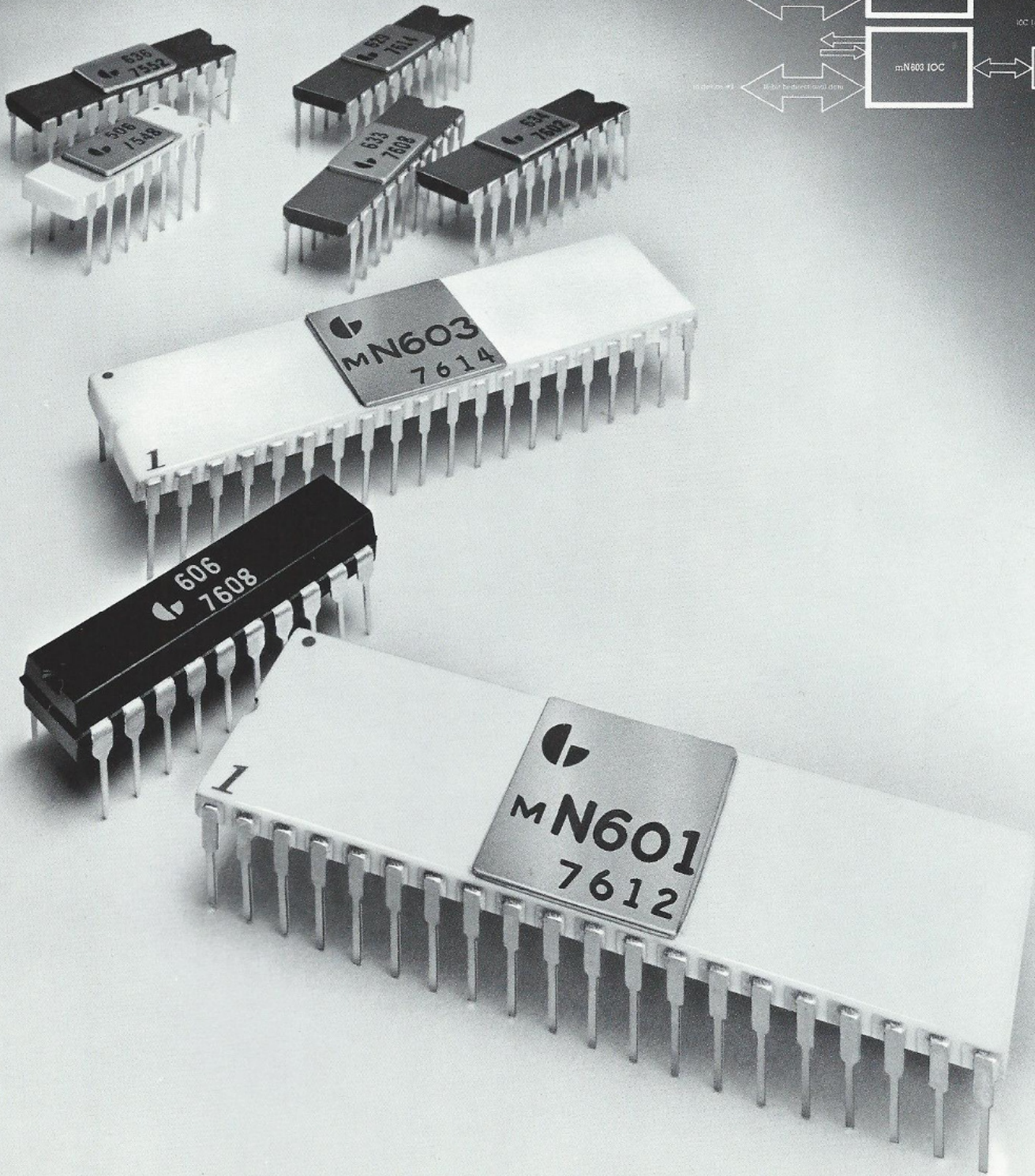
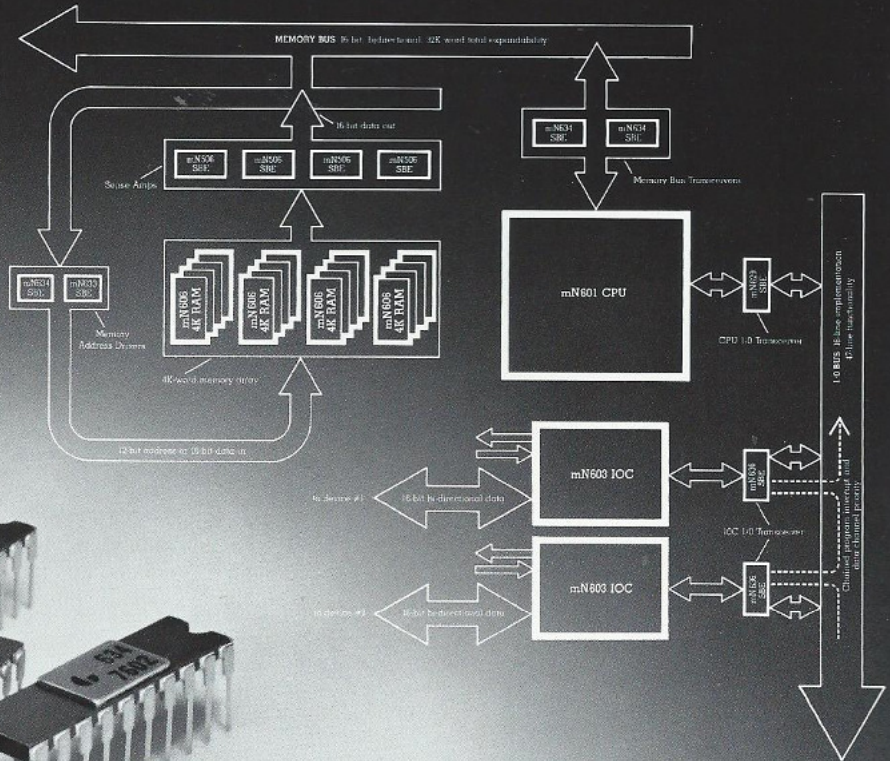
Load Accumulator . . . . .	2.88
Store Accumulator . . . . .	2.88
Indirect Addressing: Adds . . . . .	.96
Add . . . . .	2.4
Subtract . . . . .	2.4
Negate . . . . .	2.4
Increment . . . . .	2.4
Move . . . . .	2.4
And . . . . .	2.4
Complement . . . . .	2.4
Add Complement . . . . .	2.4
Increment & Skip If Zero . . . . .	3.84
Decrement & Skip If Zero . . . . .	3.84
Jump . . . . .	2.88
Jump to Subroutine . . . . .	3.36
Multiply . . . . .	41.28
Divide . . . . .	59.04
I/O Input Instructions . . . . .	7.2
I/O Output Instructions . . . . .	4.8
Push Accumulator . . . . .	3.36
Pop Accumulator . . . . .	3.36
Save . . . . .	7.68
Return . . . . .	7.2

The microNOVA mN601 microprocessor is a NOVA 16-bit CPU in a single 40-pin ceramic package.



The complete microNOVA chip set lets OEMs economically implement their own micro-computer designs.

The microNOVA chip set has separate memory and I/O busses that allow maximum flexibility in expanding and configuring systems.



# microNOVA: NOVA Computer In A Chip Set

The microNOVA mN601 CPU is supported by three chip types: the mN606 4096-bit dynamic RAM, the mN603 I/O Controller (IOC), and System Buffer Elements (SBEs). These chips are the result of Data General's semiconductor development experience and contain some of the highest-performance N-channel silicon-gate MOS technology available anywhere.

## **mN601 Central Processing Unit**

The mN601 is a NOVA CPU in a 40-pin ceramic Dual In-line Package. Six circuit pins are devoted to I/O functions. Three pins (two data, one clock) provide a bidirectional data path between CPU and IOCs. One indicates the direction of I/O transfer. Two are needed to signal the CPU that an IOC is requesting a Program Interrupt or a Data Channel Interrupt.

Nineteen pins are used for the memory interface. Sixteen make up a full parallel bidirectional memory bus for address and data transfers, and three provide memory timing and control from the CPU.

The remaining fifteen pins are used for power, clock, and miscellaneous functions. A two-phase clock uses two pins. Four voltage levels plus ground use seven pins. Power-up and run control use two pins. Four are currently unused.

## **mN606 4096-bit Dynamic RAM**

Data General's 4K RAM is organized 4096-bits by one. Its 20-pin packaging permits separate pins for each of 12 address bits as well as data in and data out. This results in an access time of 160 nanoseconds—one of the fastest in the industry—and contributes significantly to the microNOVA family's high performance.

## **mN603 I/O Controller**

The mN603 IOC is a 40-pin package that provides an I/O bus interface for each peripheral device. It provides the function of the 47-line NOVA I/O bus by decoding a 16 megabit/second encoded serial data stream from the CPU. The "intelligent" IOC goes beyond this bus-adaptor function to incorporate complex functions that are outboard on the most powerful minicomputer systems. It includes integral device identification, BUSY-DONE interrupt logic, and a per-device interrupt masking capability. For block-oriented controllers, it includes data channel (DMA) bus handshaking, and full 15-bit

address and block length registers. And it doesn't ignore system-level details like power-up initialization logic, orderly power shutdown circuitry, and user-selectable data bus signal polarity. The result is that controllers that take over 100 chips to implement on traditional minicomputers can be done with about 50 in the microNOVA family.

## **System Buffer Elements**

Five high-density SBEs give the microNOVA family its full expansion capability and high noise immunity. Two mN634 Memory Bus Transceivers, each handling eight lines, buffer the 16-bit parallel memory bus. Two mN634 Memory Address Drivers, each handling eight lines, provide the address and bank-selection drive for each 4K-word memory array.

Four mN506 Sense Amplifier /Bus Drivers, each sensing four mN606 RAM "data out" signals, strobe buffered data directly onto the 16-bit memory bus. The mN629 CPU I/O Transceiver and the mN636 IOC I/O Transceiver buffer the I/O bus. They provide differential drive of key signals for noise immunity and hundred-foot bus length.

## **Standard Bipolar Chips**

The microNOVA signal levels are compatible with standard industry bipolar parts. Any microNOVA systems requiring non-volatile program storage can use standard Programmable Read-Only Memory (PROM) chips in the memory system. A few Small Scale Integration (SSI) TTL chips round out miscellaneous functions.

1 The microNOVA computer-on-a-board is a complete microcomputer with 4K Random Access Memory. It's supported by a range of RAM and PROM memories, standard interfaces, and general-purpose boards.

2 A hand-held console adds programming capabilities to the basic operator control panel, and permits easy operation.

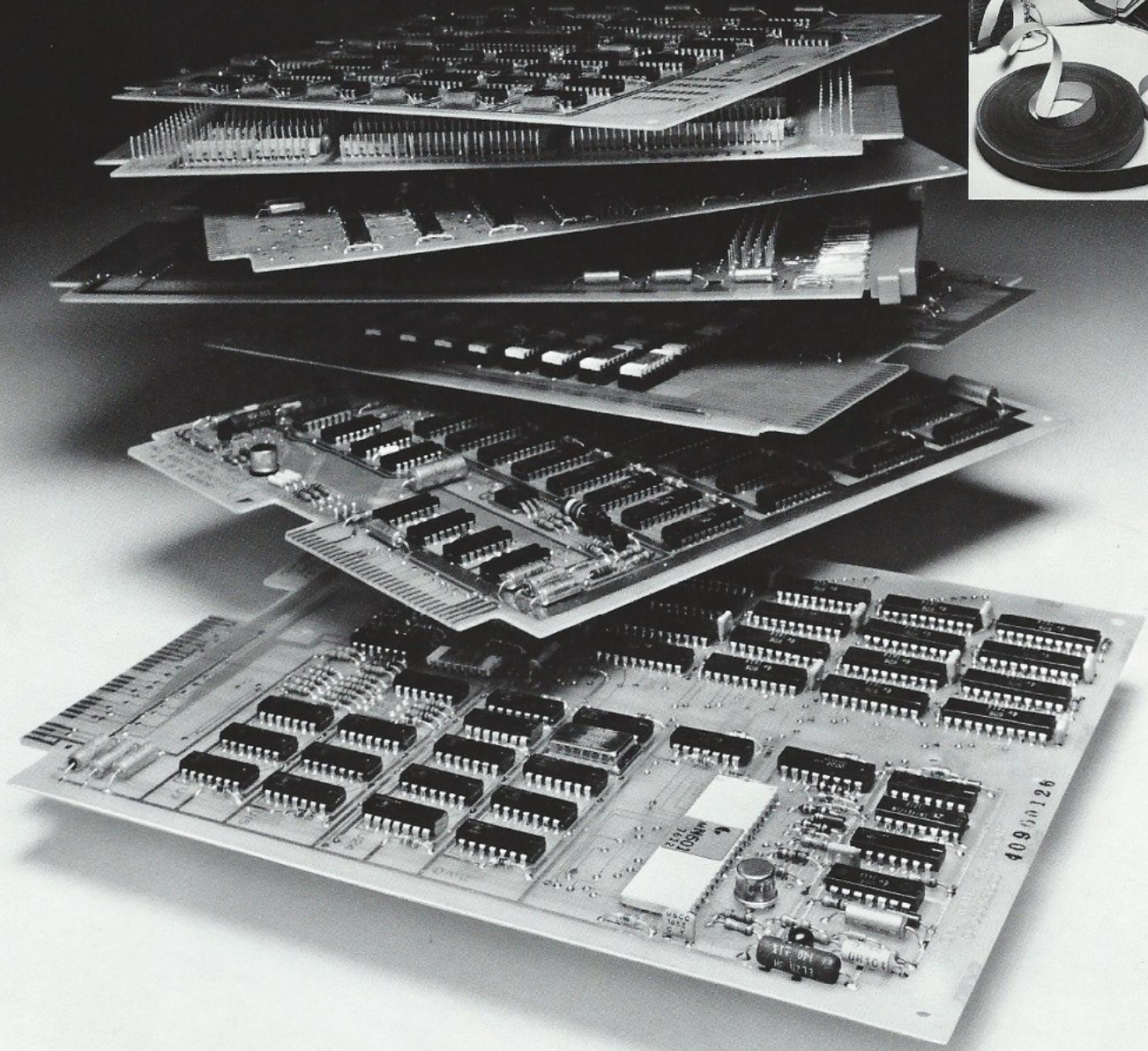
3 Multiple microNOVA card frames can be easily chained with a compact I/O bus cable and integral backplane connectors, up to 100 feet.



2



3





# microNOVA: NOVA Computer On A Board

## microNOVA CPU Board

When assembled on a single 7½" X 9½" board, the microNOVA chip set becomes a powerful, fully buffered microcomputer with 2K/4K words RAM. It operates with a variety of memories and interfaces, all mounted on 7½" X 9½" boards, for wide configuration flexibility.

## RAM, PROM Memory Boards

Additional Random Access Memory is available in 4K- or 8K-word increments. Programmable Read-Only Memory boards come with up to 4K-word capacity. Combinations of RAM and PROM up to 32K words are available for applications requiring large memory.

## Interfaces: Buy Them Ready To Go

A microNOVA asynchronous interface supports Data General terminal printers and video displays, for large system configurations. An interface to Data General's diskette subsystem gives OEMs an economical, powerful runtime and development system for the microNOVA family.

## Interfaces: Build Your Own

A microNOVA General-Purpose Interface board gives OEMs the basic components needed to build special interfaces quickly and easily. The board includes the I/O Controller (IOC) and its supporting drivers. It is a fully integrated NOVA I/O system, with room to accept special interfaces on the same board. The IOC simplifies complex controller fabrication by integrating DMA control functions. This means controllers that required a full 15" board on NOVA computers now fit the microNOVA 7½" X 9½" format.

## Accessories For Easy Programming, Maintenance, and Fabrication

The microNOVA computer-on-a-board is available with a wide variety of accessories that facilitate programming, troubleshooting, and fabrication. A PROM burner lets OEMs burn debugged programs into PROM assemblies. An extender board gives convenient access to printed circuit assemblies for design and maintenance. A 9-slot backplane/card frame and a power supply assembly simplify board packaging.

## Simplified I/O Cabling

Multiple microNOVA card frames (stand-alone or in the packaged microNOVA minicomputer) can be chained together via the 16-line flat-ribbon I/O bus cable, up to a total length of 100 feet. 50-line flatribbon cables are available to connect controller cards to freestanding devices. No wirewrapping is required, since card frame chaining and device cabling is done with simple plug-in connectors. The result is convenient, reliable and economical I/O cabling.

## A Microcomputer That Lets You Grow

The microNOVA computer-on-a-board is electrically and architecturally compatible with the microNOVA minicomputer and microprocessor. Family compatibility lets OEMs move down to chip level integration or up to the MOS minicomputer level as product or market requirements change. Starting with the microNOVA computer-on-a-board means low initial development cost, and the ability to get products to market fast. There's no need to build up a purchasing organization, chip inventory, or a manufacturing and testing facility. There's no need for a maintenance group either, because Data General can take care of that. Just send the board to a Data General factory depot.

# microNOVA: NOVA Computer In An MOS Mini

The microNOVA is available as a fully packaged 4K-word MOS minicomputer with power supply and operator control panel. It comes in 9-slot or 18-slot versions, each having a full 32K RAM/PROM memory capacity. The combination of economy, performance, software, and peripherals makes it a highly competitive end product. And as an in-house support tool it provides OEMs with complete design, manufacturing, and field support for microNOVA-based products.

## **A Competitive OEM End Product**

As a completely packaged MOS minicomputer, the microNOVA gives OEMs minicomputer power at a price that's lower than most bipolar machines. NOVA architecture and software makes it easy to program. Easy system integration and maintenance simplify product development. And low front-end resource commitment gets OEM products to market faster and cheaper. With the microNOVA minicomputer, OEMs start on the highest integration level. As volume increases, they can build up production capabilities at a controlled rate and move to the board or chip integration level.

Data General's microNOVA family lets OEMs separate vendor choice from integration level. At the MOS minicomputer level, OEMs save investment in metal fabrication facilities and operations, component assembly, and system checkout. At board level, OEMs eliminate component inventory, IC insertion, and checkout. But they still have the economy of building from chips when volume justifies it.

## **It's An In-House Support Tool**

The microNOVA MOS minicomputer is also a powerful in-house tool for OEMs who use it to get their end product to market.

It's a powerful interface tool for hardware designers, because it provides conveniently-packaged microNOVA components for interface debugging.

The microNOVA diskette-based Disc Operating System (DOS) speeds program development by supporting high-level languages like FORTRAN and DOS BASIC, and powerful editing, assembly, and debugging facilities.

In manufacturing, the microNOVA minicomputer is ideal for interface debugging, reliability burn-in, and PROM program loading.

Its compact size makes it useful as a field service test bed.

It simplifies an OEMs personnel training, since engineers, programmers, and manufacturing people get hands-on experience at low cost.

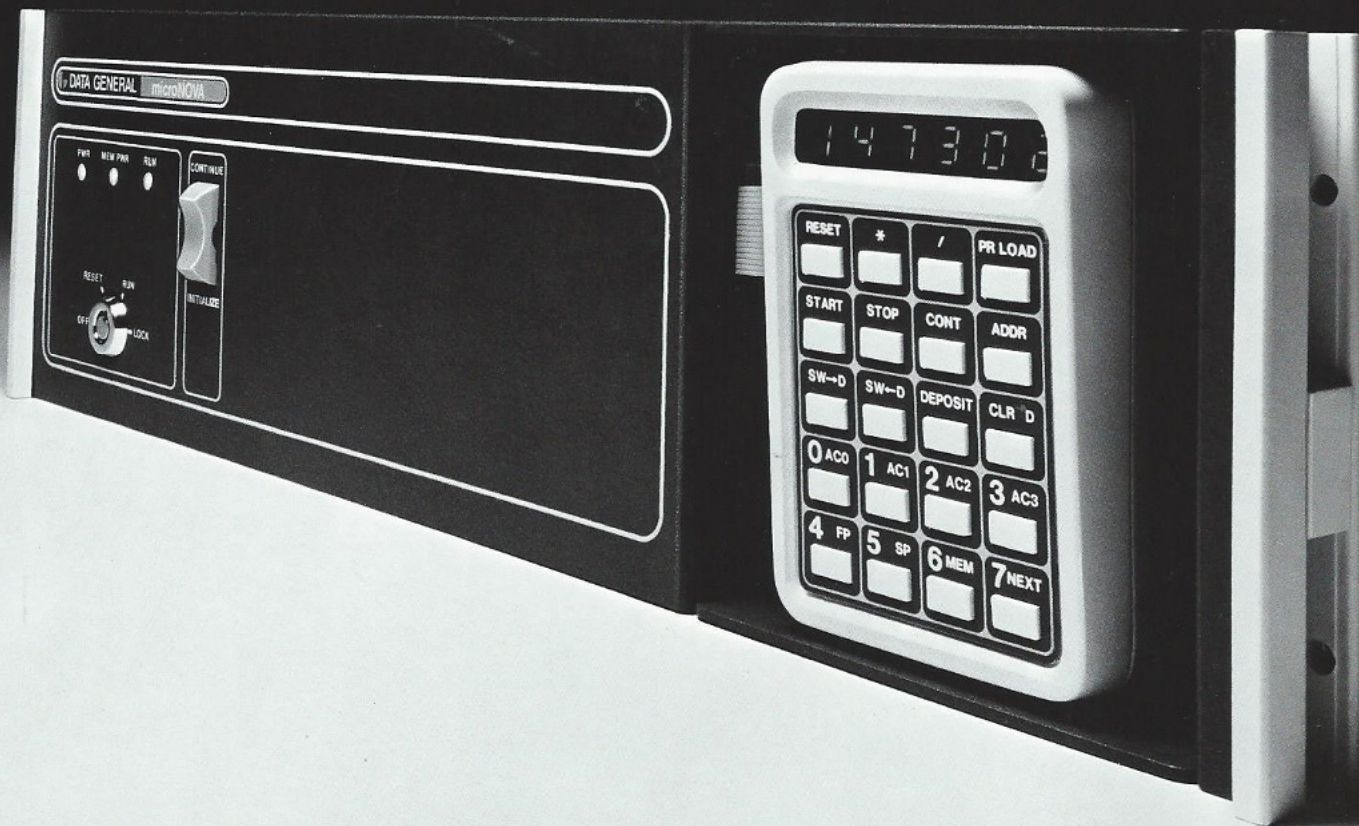
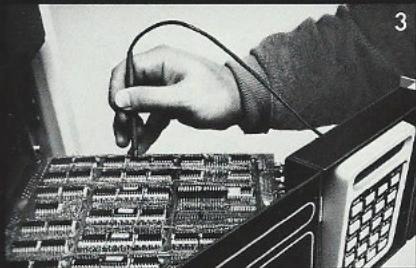
And marketing and finance people will like the microNOVA minicomputer because it gets products to market faster, generating a favorable cash flow profile immediately.



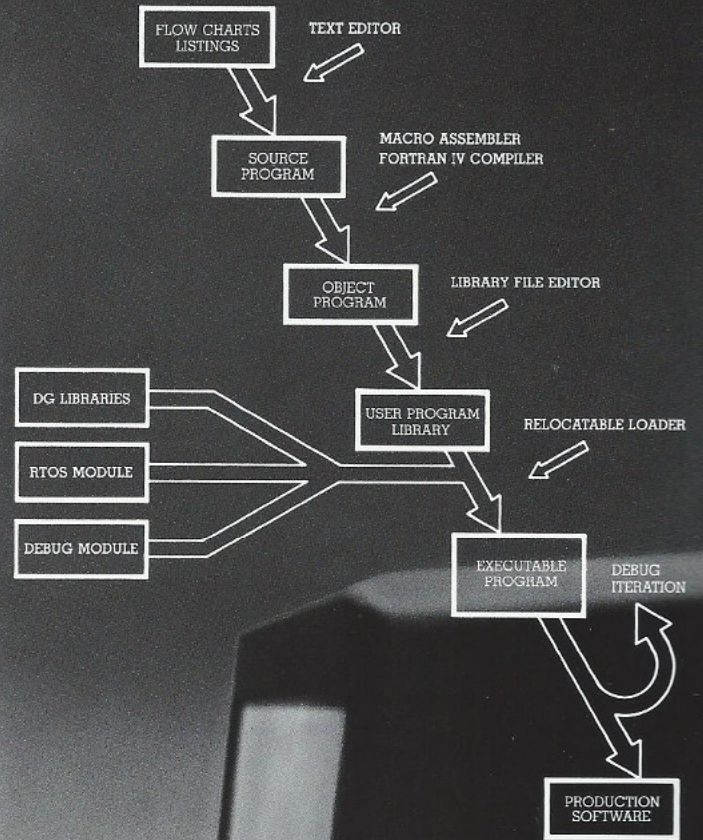
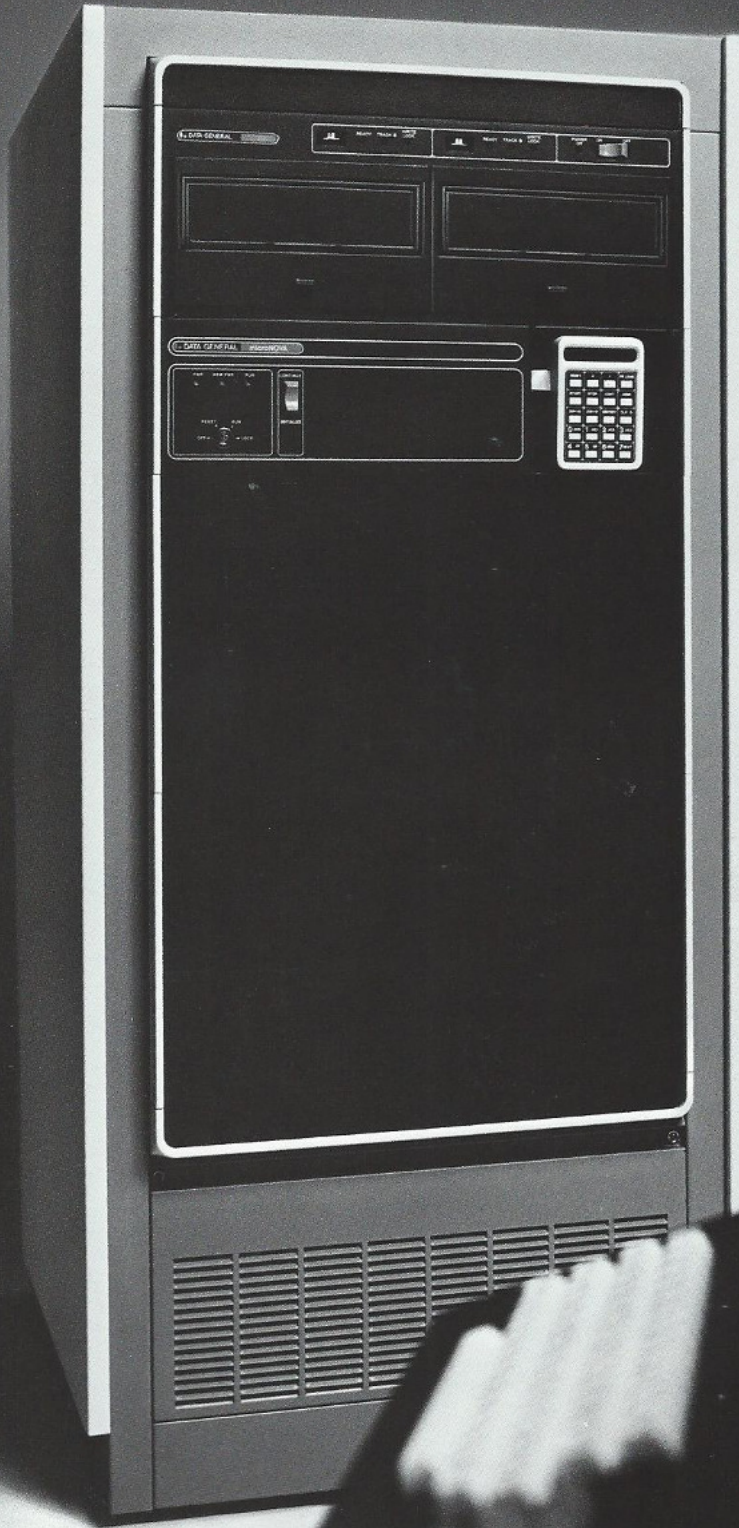
1 microNOVA minicomputer is a fully packaged 9- or 18-slot 4K-word MOS minicomputer with power supply and operator control panel.

2 The microNOVA minicomputer's 16-bit architecture makes it a competitive OEM end product for applications like medical instrumentation, that require high precision and throughput.

3 microNOVA is a powerful in-house support tool for design, testing, and maintenance.



DOS AND CLI: INVOKES AND CONTROLS PROGRAMS AT EACH EXECUTION PHASE



1 The microNOVA MOS minicomputer with Data General's diskette subsystem and DOS software is the most powerful micro-based development system available.

The microNOVA family comes with the most advanced software available on a micro, from the Real-Time Operating System to FORTRAN IV.

# microNOVA: Micros With NOVA Software

The microNOVA family comes with the most extensive array of development and runtime software available anywhere, proven in over 35,000 NOVA computer systems around the world.

For OEMs who need a larger development system, there's NOVA 3. NOVA 3 is compatible with microNOVA but supports up to 128K words of memory, a full peripheral range, and the Real-time Disc Operating System.

## Disc Operating System

microNOVA development software is based on the Disc Operating System (DOS), part of Data General's compatible Real-time Disc Operating System (RDOS) family. The diskette-based DOS provides a smooth flow through varying development phases to completed production software. It provides operator interface features, peripheral control, and file management. Interrupt handling, physical I/O, and file processing are made transparent to the user.

## Command Line Interpreter

The Command Line Interpreter (CLI) is an easy-to-learn operator interface to DOS. It provides the operator with extensive file maintenance capabilities, control over system utilities, and a simple way to invoke complex sequences of program executions.

## Text Editor

Data General's powerful text editor dramatically simplifies program entry and correction, one of the most time-consuming chores in program development. The editor combines multiple text streams, "remembers" often-used editing sequences, and even executes a "program" of conditionally-looping text modification commands.

## FORTRAN IV Compiler

The microNOVA family uses Data General's FORTRAN IV, a high-level language that exceeds ANSI standards, with multitasking extensions essential for real-time applications. FORTRAN IV supports multiple I/O formats, in-line assembly language coding, and relational and logical operators. It generates reentrant code that can be shared by multiple tasks for memory efficiency and ROM-based program storage.

## DOS BASIC

The microNOVA family uses a DOS (diskette-based Operating System) BASIC programming language that is a subset of RDOS Extended BASIC. It is available in both single-user and

multi-user versions, with extensions to Dartmouth BASIC including string arithmetic and matrix I/O operations.

## Assembler

The Macro Assembler brings high-level language features to assembly language programming. Macro instructions translate a single multi-argument source line into a sequence of machine instructions. These macros can be accumulated in easily-used libraries that eliminate repetition.

## Library File Editor

The Library File Editor lets users combine compiler or assembler output to form binary libraries. The result is a set of central, updatable program libraries that eliminate program duplication.

## Relocatable Loader

The Relocatable Linking Loader lets users combine multiple independent binary modules into an executable program. Capabilities include automatic library search, conditional load, comprehensive load map listings, and origin definition flexibility.

## Real-Time Operating System

Data General's Real-Time Operating System (RTOS) is a DOS-compatible runtime executive. It's compact and memory-resident, and has a real-time multitask capability for controlling real-time applications. RTOS provides standard interrupt servicing, device handling, and execution-scheduling functions.

## Data General Libraries

Data General supplies a powerful set of libraries for complex character-formatting I/O routines, logarithmic, exponential, and trigonometric function evaluation, and comprehensive array handling.

## Symbolic Debugger

The Symbolic Debugger facilitates program debugging with symbolic designation of user labels, assembler mnemonics, and program offsets. Symbolic references allow program debugging in source-language terms that don't require cumbersome binary translation. Multiple-format printout directives let data be listed as characters, half-words, symbols, or in octal format. Program debugging in the actual runtime machine, rather than a simulator, simplifies trapping timing-dependent and interface-dependent bugs.

# microNOVA: NOVA Computer Power For Tough Applications

The microNOVA family brings NOVA-line performance to a wide range of applications at each packaging level — microprocessor, micro-computer, and MOS minicomputer.

## microNOVA Microprocessor In Instrumentation Systems

Many complex instrumentation systems need the high performance and accuracy offered by the microNOVA microprocessor. Radio-navigation systems such as LORAN and OMEGA are an example. They use transmission patterns from synchronized transmitters to determine the position of receivers onboard ships and aircraft. The microNOVA microprocessor is easily packaged to meet space restrictions of such navigation systems, and provides data in real-time with far greater precision than traditional manual methods.

In addition:

- microNOVA 16-bit accuracy maintains superior precision in lengthy calculations.
- The microNOVA high-performance CPU does complex numerical and statistical computations in real-time applications too fast for other micros. And since the IOC allows block data-input interfaces to be implemented as simply as word-by-word programmed I/O, the CPU is free to do straight computation.
- microNOVA multitasking operating system software combines data from more than one radio navigation system. This produces better information than one system operating alone could provide.
- microNOVA real-time FORTRAN and arithmetic libraries ensure efficient and accurate computation of triangulation calculations and statistical filtering algorithms.

## microNOVA Microcomputer In Industrial Automation

A variety of industrial automation processes need economical computing and control power applied at each unit of production. Typical production processes are packing lines, newspaper printing presses, numerically-controlled milling machines, and pipeline pumping stations. The microNOVA computer-on-a-board is ideal for such applications because:

- Simplicity of interfacing facilitates use with a variety of sensor and control elements that range from simple program I/O lines, to sophisticated Direct Memory Access data collection devices.

- The compact 16-line flatribbon I/O bus simplifies cable routing and minimizes cable costs. Its 100-foot length lets interfaces be chained to various sensor stations on a large machine.
- The simplicity of I/O and cabling allows multiple CPU's to monitor the same interface, for redundancy in critical applications.
- The differential drive of I/O bus signals allows I/O cables to be routed around heavy rotating-field machinery, while still maintaining signal integrity.

## microNOVA MOS Mini In Communications Systems

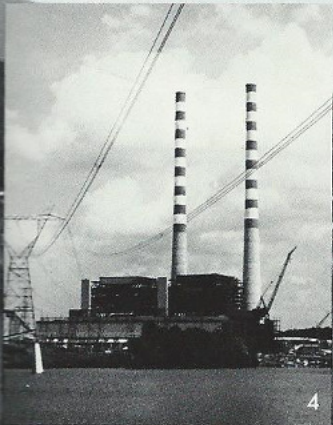
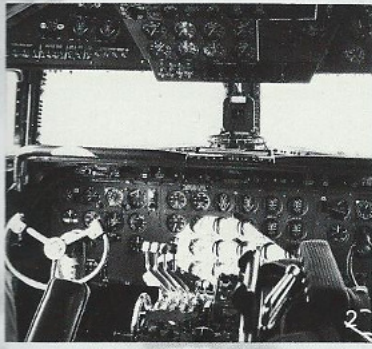
Many communications systems need economical computing solutions at the source of data entry in a computer network. The microNOVA minicomputer is ideal for remote terminal applications such as order entry and update, parts distribution, and inventory control because:

- The 18-slot chassis can hold up to 32K words of memory in a fully integrated system package.
- It can be configured with Data General's diskette subsystem, CRT, and terminal printer product line, allowing a wide range of system configurations.
- It is architecturally compatible as a low-cost component with the entire family of Data General network components.

## microNOVA MOS Mini In Data Acquisition Systems

Remote data acquisition systems, typically small, geographically-dispersed stations, must operate in fully unattended modes. They must be highly reliable and capable of continuously gathering data and reporting to a host computer. Air pollution monitoring is a typical example. The completely packaged microNOVA minicomputer is a good off-the-shelf fit for an application like this because:

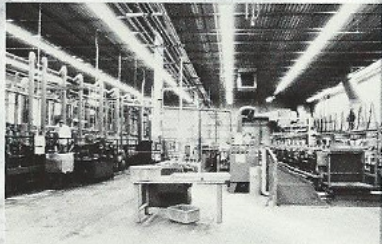
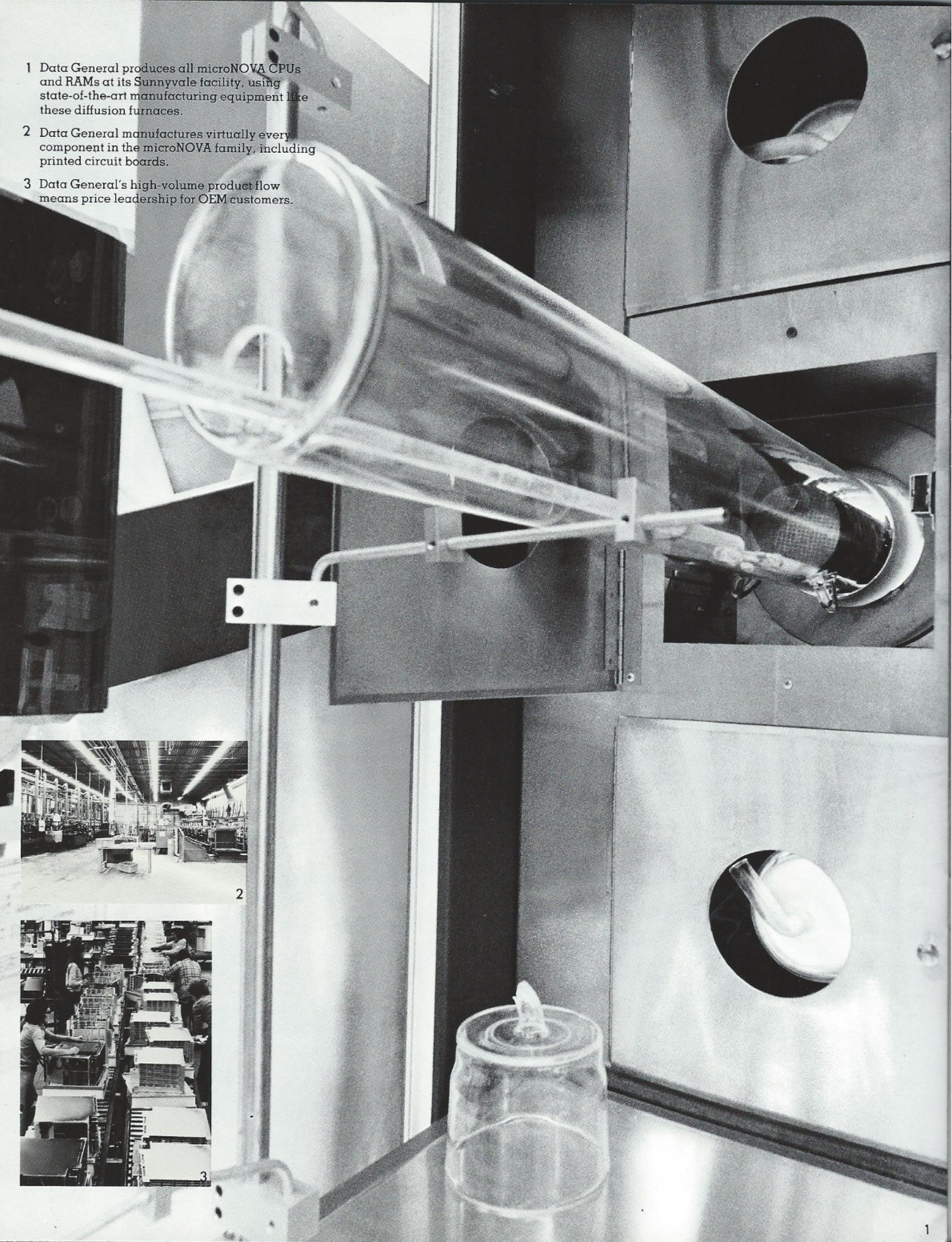
- It is ideal for stand-alone unattended operation; high reliability allows a total system chip count (including interfaces) of 60-70, compared to 200 or more in a bipolar CPU alone. Non-volatile PROM is available for storage, bootstrap restart, and power fail interrupt. And battery backup provides protection for data stored in Random Access Memory in case of power failure.
- The microNOVA MOS mini's 16-bit precision permits highly accurate manipulation of input data and statistical computations, with far greater accuracy than 8-bit precision allows.
- I/O bus architecture and performance accommodates multiple high-bandwidth sensing devices.



- 1 The microNOVA computer-on-a-board puts economical computing and control power at each unit of production in industrial automation systems.
- 2 Complex instrumentation systems need the microNOVA microprocessor's performance, accuracy, and efficient packaging.
- 3 The complete microNOVA MOS minicomputer is ideal for remote terminal applications like data entry.
- 4 Remote data acquisition applications like pollution monitoring can depend on the microNOVA minicomputer's high reliability for unattended operations.



- 1 Data General produces all microNOVA CPUs and RAMs at its Sunnyvale facility, using state-of-the-art manufacturing equipment like these diffusion furnaces.
- 2 Data General manufactures virtually every component in the microNOVA family, including printed circuit boards.
- 3 Data General's high-volume product flow means price leadership for OEM customers.



2



3



# **microNOVA: Micros From A Computer Company**

The microNOVA family is designed and manufactured by a computer company. This unique combination means real benefits for OEMs who need a high function micro-level product backed with a full range of computer-level support.

## **A Big OEM Commitment**

The microNOVA family is backed by Data General's extensive OEM experience, developed over seven years, with 20,000 NOVAs installed around the world. A liberal OEM discount structure, a broad OEM product line, and on-time product deliveries are all part of Data General's commitment.

## **Vertical Integration, Volume Flow**

Data General manufactures the microNOVA CPU, RAM, and nearly every other part of the microNOVA family — everything from chassis and printed circuit boards to MOS and bipolar circuits. This vertical integration is coupled with the high-volume flow that comes from the world's most popular 16-bit computer line. For

OEMs, this means a continuation of the price leadership that has always characterized NOVA computers.

## **Semiconductor Technology From Sunnyvale**

The microNOVA CPU is manufactured at Data General's Sunnyvale, California facility, along with MOS memories made for NOVA computers. These advanced products result from ongoing semiconductor research that assures continuing, economical solutions to OEM problems.

### **Training From A Computer Company**

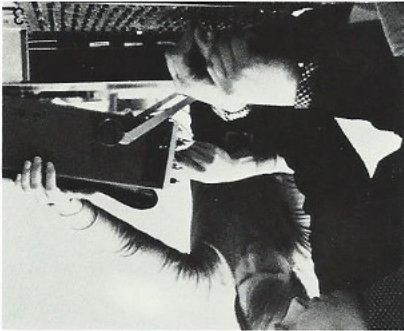
microNOVA courses are conducted by a training department with over seven years of curriculum development to its credit. Experience gained by instructing over 15,000 computer professionals is part of every microNOVA course. A special 5-day course, "Designing With The microNOVA Minicomputer," helps OEMs develop self-sufficiency in hardware design, programming, and maintenance. A broad range of standard NOVA courses, such as the Real-Time Operating System course, are available for advanced needs.

### **Documentation From A Computer Company**

A full range of computer-level documentation is available with the microNOVA family. It includes programmer's reference manuals, system interfacing manuals, systems software manuals, and technical references. All reflect the comprehensiveness that OEMs expect from Data General.

### **Worldwide Support From A Computer Company**

Data General provides a worldwide service network to give OEMs in-depth support. On-call computer maintenance, and convenient regionally-located depot service keep equipment up and running. A large staff of sales engineers and systems support specialists help OEMs match Data General products to their applications. Data General's Software Subscription Service keeps OEMs up-to-date on the software they use. A Hardware Subscription Service details the latest engineering improvements incorporated into the product line, through a series of log books. A Special Systems group helps users with special requirements such as integrating microNOVA chips or boards into customer products and manufacturing custom controllers and interfaces. The Data General User's Group encourages exchange of current systems and applications information.



- 1 microNOVA courses are conducted by Data General instructors who have trained over 15,000 computer professionals.
- 2 The microNOVA family comes with the same comprehensive documentation that supports Data General's NOVA line.
- 3 The entire microNOVA family is backed by Data General's world-wide service network.

**microNOVA:  
Micros That Are Really  
NOVA Computers**

Please send more information on

microNOVA microprocessors, microNOVA microcomputers, and microNOVA MOS minicomputers.

Other (specify) \_\_\_\_\_

Please have a sales engineer contact me.

Please add me to your mailing list.

Name \_\_\_\_\_

Title \_\_\_\_\_

Company \_\_\_\_\_

Street \_\_\_\_\_

City \_\_\_\_\_

State \_\_\_\_\_ Zip \_\_\_\_\_

Telephone \_\_\_\_\_

**NORTH AMERICAN OFFICES:** Westboro, Massachusetts 01581, (617) 366-8911 Headquarters. And AL: Homewood; AZ: Phoenix, Tucson; CA: El Segundo, Palo Alto, Sacramento, San Diego, San Francisco, Santa Ana, Santa Barbara, Van Nuys; CO: Engelwood; CT: North Branford; FL: Ft. Lauderdale, Orlando, Tampa; GA: Atlanta; IL: Peoria, Schaumburg; IN: Indianapolis; KY: Louisville; LA: Baton Rouge; MA: Springfield, Wellesley; MD: Baltimore; MI: Southfield; MN: Minneapolis; MO: Clayton, Kansas City; NC: Charlotte, Greensboro; NH: Nashua; NJ: Cherry Hill, Wayne; NM: Albuquerque; NV: Las Vegas; NY: Latham, Melville, New York City, Newfield, Orchard Park, Rochester, Syracuse; OH: Columbus, Dayton, Euclid; OK: Oklahoma City, Tulsa; OR: Portland; PA: Blue Bell, Carnegie; RI: Albion; TN: Knoxville, Memphis; TX: Austin, Dallas, Houston; UT: Salt Lake City; VA: Hampton, McLean, Richmond, Salem; WA: Kirkland; WI: Menomonee Falls; CANADA: Calgary, Alberta; Dollard-Des Ormeaux (Montreal), Quebec; Edmonton, Alberta; Ottawa, Ontario; Richmond, B.C.; Toronto, Ontario.

**INTERNATIONAL OFFICES:** AUSTRALIA: Melbourne, Victoria; Sydney, N.S.W.; AUSTRIA: Vienna; BELGIUM: Brussels; BRAZIL: Sao Paulo; COSTA RICA: San Jose; DENMARK: Copenhagen; ECUADOR: Quito; EGYPT: Cairo; FINLAND: Helsinki; FRANCE: Paris, LaBoursidiere, Lyon; GERMANY: Dusseldorf, Eschborne, Hamburg, Munich; GREECE: Athens; HONG KONG; IRAN: Teheran; ISRAEL: Tel Aviv; ITALY: Milan, Rome; JAPAN: Tokyo; KOREA: Seoul; MALAYSIA: Kuala Lumpur; NETHERLANDS: The Hague; NEW ZEALAND: Wellington; PERU: Lima; PHILIPPINES: Market Rizal; PUERTO RICO: Hato Rey; SINGAPORE; SOUTH AFRICA: Pretoria; SPAIN: Barcelona, Madrid; SWEDEN: Gothenborg, Malmo, Stockholm; SWITZERLAND: Lausanne, Zurich; UNITED KINGDOM: Birmingham; Cheshire; Greenford (London), Middlesex; Glasgow, Scotland.



Data General Corporation, Westboro, Massachusetts 01581, (617) 366-8911