competitive update

Competitive Evaluation Of The Computer Based Controller Market

ALSO IN THIS ISSUE: DIGITAL VS IBM DISK UPDATE

digital

competitive update

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RCS: HPLT   RCS: HPLT   RCS: HPLT

The Industry Marketing Group of TVG has recently launched a marketing program to pursue the CBC market. The Computer Based Controller market (CBC) refers to a broad general market where CONTROL is the primary function. This general market includes both the discrete and continuous manufacturing markets. Examples of specific markets include the following:

- Process Control
- Numerical Control (NC, CNC, DNC)
- Robotics
- Materials Handling
- Automatic Test Equipment (ATE)
- Facilities Management Systems
     (energy management plus more)

The OEM and End-User segments of the CBC market are estimated to be roughly equal in size. The OEM portion for calendar year 1982 has been estimated at approximately $420 million and is forecast to grow at an average rate of 15% over the next three years.

As part of the sales aids provided to the field, the following competitive analysis was made of three companies -- Computer Automation, Data General and General Automation.

COMPETITIVE INFORMATION ON COMPUTER AUTOMATION

NOTES ON COMPUTER AUTOMATION

The Company: Computer Automation, Inc. manufactures low-cost, general-purpose minicomputers sold primarily to OEMs, and designs and produces automatic test equipment. The company was founded in Irvine, California in 1967, but moved its headquarters to Boulder, Colorado in 1981.

Computer Automation currently operates in the following three divisions:

- The Commercial Systems Division -- manufactures SyFA distributed data processing systems. Its customers are typically large corporations with central data processing departments featuring mainframe computers.

- The Industrial Products Division -- manufactures and sells automatic test equipment (ATE) under the CAPABLE and SPRINT names. Its primary customers are manufacturers of electronic circuit boards.

- The Naked Mini Division -- carries on the company's original business - the manufacture and sale of inexpensive minicomputers for use primarily by OEMs. Processors from this division form the nucleus of all company product lines.

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Financial Data:

	Fiscal Year Ended June 30,					
	1982	1981	1980	1979	1978	1977
Sales $M	68	76	81	64	61	43
Net Earnings (Loss) $M	2.02	1.65	4.60	(4.19)	6.14	5.32
Earnings (Loss) Per Share	.98	.81	2.30	(2.13)	3.08	2.72

Pricing: Computer Automation sales representatives adjust prices in the field regularly. However, in sales situations where Computer Automation has made a firm quote and price is the deciding factor, TVG Operations may be able to help.

Outlook: Computer Automation is a small company -- with fiscal year 1982 sales of $68 million, it is about the size Digital was sixteen years ago. Yet the company's Naked Mini is well established as a reliable, low-cost OEM processor in both industrial and commercial markets. Their "hardware store" approach to marketing, whereby customers buy only the pieces they need to assemble their own systems, has great appeal to technically sophisticated OEMs and end users.

However, at Computer Automation:

• Most engineering and marketing focus seems to be on commercial SyFA systems. The most popular industrial-oriented products are five and seven years old, with their most recent one introduced in 1980.

• Disappointing sales have impaired the company's ability to aggressively introduce new products and pursue new markets.

COMPUTER AUTOMATION PRODUCTS AT-A-GLANCE

Computer Products

Model	First Shipment	Total Shipped	Typical Price	Comments
LSI 2/40	1980	900	$ 8,500	The LSI series is being phased
LSI 2/10	1974		2,600	out in favor of the Naked
LSI 2/20	1975	32,700	2,900	Mini 4.
LSI 2/60	1975		9,600	
LSI 3/05	1975		?	
Naked Mini 4/04	1979	2,250	1,000	The NM4/04 is called "Scout."
Naked Mini 4/10	1977	3,500	800	Processors from the NM line
Naked Mini 4/30	1977	2,500	3,000	are engines for all other CA
Naked Mini 4/90	1977	1,470	9,600	computer-based products. NM
Naked Mini 4/95	1980	325	19,500	products are sold to OEMs
				typically for technical
				applications.
SyFA JR-200	1979	350	34,000	
SyFA 300	1980		40,000	SyFA stands for System For
SyFA 1000	1976	590	100,000	Access. These systems are
SyFA 200	1981	2	250,000	sold to commercial markets
				only.

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- OMNIX is a new commercial product, built around the NM 4/04, available in two configurations:

  - 64 or 128KB, 2MB floppy, supporting up to 8 terminals
  - 64 or 128KB, 10MB Winchester, 1MB floppy, supporting up to 16 terminals

- Workstation I is a new intelligent video terminal for use alone or with OMNIX.

- CARTOS, announced in June 1982, is a new real time operating system for Naked Mini systems.

- SyFA NET, another commercial product, supports building-size local area networks.

Industrial Products

- CAPABLE is the name of a family of circuit board testers sold into the ATE market.

- SPRINT, another ATE product, is a program simulation system used to generate test programs for specific customer products.

- CAV-1000 is a new computer-based vision system demonstrated at the Autofact show in Philadelphia in December 1982.

SURVEY OF COMPUTER AUTOMATION CUSTOMERS

While conducting a telephone survey of OEMs in the U.S. Computer Based Controller market, TVG's Industrial Marketing Group identified thirteen CA customers who made these comments:

Positive Comments About CA	Frequency	Negative Comments About CA	Frequency
Good Price	4	Poor Maintenance and Sales Service	9
Good Software	2	Not State-of-the-Art	4
Reliable Hardware	2	Poor Software	4
Right Hardware for Application	2	Hardware Problems	3
		Price Too High	1
		Poor Documentation	1

From this you could draw two conclusions:

- Computer Automation products are well suited and aggressively priced for applications in the industrial controller marketplace.

- Computer Automation customers are aware of the deficiencies of their vendor.

ADVANTAGES FOR THE NAKED MINI 4 FAMILY

The seemingly low price of the Naked Mini 4 family of processors can be put into better perspective when certain hidden costs are considered. This section points out hidden costs in the following categories:

- Software Not Backward Compatible: Naked Mini 4 software is not compatible with the software of the LSI family of processors that preceded it. Any prospect using this older LSI family of products will have to abandon their software investment before migrating to the Naked Mini 4, and would be prime candidates for conversion to another vendor.

- Instruction Sets: The instruction set for each member of the Naked Mini 4 family is a subset of the instructions for the next higher family member. In equation form:

        Instruction Set: 4/04 < 4/10 < 4/30 < 4/90 < 4/95.

  The range is quite wide, from 87 instructions on the 4/04 to 171 on the 4/95. If a Computer Automation customer wants to move up the line within the Naked Mini 4 family, they probably should rewrite their programs to take advantage of the additional instructions. Similarly, a customer moving down the line will have to rewrite the programs to remove inappropriate instructions.

- Scout's Unique Bus: Although the Naked Mini 4/04 Scout Bus "implements the same functionality" as the Maxi-Bus used on all other members of the Naked Mini family, it is physically smaller. This means memory, I/O controller and other interface boards purchased for use on Scout, which is the entry-level system, may not be re-used on any other processor. This contrasts sharply with the flexibility available to users on Digital's LSI-11 Bus.

- Commercial Emphasis: It is clear that Computer Automation has shifted its marketing emphasis away from industrial applications toward the commercial environment. Computer Industry Update, which summarizes articles appearing in the trade press, reports on twelve news items released by Computer Automation in 1982. The stories can be grouped by topic as follows:

Topic	Number of Stories
Enhancements to SyFA Commercial Systems	6
Financial Results	5
Management Reorganization	1

  Note that the industrial-oriented Naked Mini is not mentioned at all. Computer Automation customers who read industry periodicals are probably aware of this neglect and should be reminded of Digital's commitment to the industrial marketplace as demonstrated by products introduced by CSS, MDC and TVG.

● <u>Field Service</u>: Regarding field service, on-site maintenance is generally the responsibility of the user. Although it can be performed rather easily through board replacement, customers should be aware of the expense of stocking spare boards and the risk of obsolescence. Maintenance and repair by Computer Automation technicians is possible, but the limited number of CA field service offices suggests that response and turnaround times may be unacceptable in some parts of the country. These users may be unaware of the wide variety of on and off-site services offered by Digital Field Service.

For OEMs who wish to provide maintenance and repair services to their customers and reap the substantial profits such services can provide, technical training is available through a series of training classes offered on a tuition basis only in Irvine, California. Your prospect should be made aware of the tuition, transportation, meals and lodging expenses involved.

● <u>Mixed Vendor Systems</u>: Except for the CRT terminal the company started manufacturing in 1977 for its commercially oriented SyFA systems, all peripherals and terminal devices are purchased by customers directly from third-party manufacturers as follows:

- Line Printers - Centronics and Dataproducts
- Card Units - Documation
- Paper Tape Units - Remex and Facit
- Magnetic Tape - ?
- Terminals - Teletype
- Disk - Pertec and Control Data

Computer Automation correctly points out that customers save money by avoiding a CA markup, but customers must also be made aware they face the expense and potential problem of microcoding the interface to the Naked Mini 4. There is also potential for mixed vendor service problems.

● <u>Local Area Network Gateways Not Available</u>: Local Area Networks of Naked Mini 4 family members are implemented with the company's Intracomm and SyFA NET software, which is based on DDCMP -- Digital Data Communications Message Protocol. However, customers who wish to link their Naked Mini 4 network to a larger network, such as a factory supervisory control system, face the time consuming and expensive prospect of writing their own gateway software. DECnet is an attractive alternative for these prospects.

Processor	Naked Mini 4/04 (Scout)	Naked Mini 4/10	Naked Mini 4/30	Naked Mini 4/90	Naked Mini 4/95
Digital Counterparts:					
Price	Falcon, LSI-11/2	Falcon, 11/23S	RAINBOW 100, 11/23S, LSI-11/23	Professional 350, Micro/PDP-11, 11/24	11/23-PLUS, 11/34A
Performance	Falcon	Falcon	11/23S, 11/23-PLUS	11/24, 11/34A	11/24, 11/44 11/730
Packaging	Board or box	Board, box or system	Board, box or system	Board, box or system	Board, box or system
Maximum Addressable Memory	128KB	128KB	128KB	128KB	8MB
Speed – ADD, register to register, full word, direct addressing mode, in micro-seconds	3.2	3.0	1.8	1.5	.85
Cache Memory	No	No	No	No	Yes, 2KB
DMA Speed, Maximum	250KB/sec.	250KB/sec.	250KB/sec.	250KB/sec.	250KB/sec.
Number of Interrupt Levels	6	6	6	6	6
Bus	Scout-Bus	Maxi-Bus	Maxi-Bus	Maxi-Bus	Maxi-Bus
Number of Instructions	87	90	107	119	171
Hardware Floating Point	Optional	Optional	Optional	Optional	Optional
Hardware Multiply/Divide	Standard	Standard	Standard	Standard	Standard

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	Naked Mini 4/04 (Scout)	Naked Mini 4/10	Naked Mini 4/30	Naked Mini 4/90	Naked Mini 4/95
Storage					
Floppy Disk, Minimum	243KB	243KB	243KB	243KB	243KB
Maximum on Standard Systems	4MB	4MB	4MB	4MB	4MB
Hard Disk, Minimum	10MB	10MB	10MB	10MB	10MB
Maximum on Standard Systems	80MB	80MB	80MB	80MB	80MB
Theoretical Maximum	1200MB	1200MB	1200MB	1200MB	1200MB
Communications					
Protocols Supported		2780, 3780, SDLC, HDLC,			
Network Architecture		Intracomm, SyFA NET			
Software					
Development Tools		Omega 4,)S4, RTX4			
Languages		ASSEMBLER, COBOL, PASCAL, FORTRAN IV, CORAL 66			
First U.S. Delivery	1979	1977	1977	1977	1980
Number Installed as of 12/81	2,250	3,500	2,500	1,470	325
Price, Quantity 1	$675 w/32KB RAM, chassis $975 w/64KB RAM, chassis	$645 board only $995 w/32KB RAM 4 on-board I/O ports, chassis, power supply, console $2,595, same as above but w/128KB $2,350 w/64KB RAM, chassis, power supply, battery backup, floppy disk controller	$2,995 w/16KB RAM, chassis, power supply, console	$9,595 w/64KB RAM, chassis, power supply, console	$19,500 w/512KB RAM, memory management unit, Cache, chassis, two power supplies

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NOTES ON SPECIFIC NAKED MINI 4 PROCESSORS

Naked Mini 4/04 Scout:

- Scout is not a single-board computer because there is no on-board memory. Memory is on two separate boards: a controller that takes one slot and a memory board that "piggybacks" off it. Falcon, on the other hand, has not only memory but also serial and parallel ports on board.
- Scout's Bus, called simply Scout-Bus, is physically smaller than the Maxi-Bus used on other Naked Mini 4 family members. I/O controller and other interface boards may not be exchanged between Scout and other family members. Falcon works with or without a card cage, bus or cabinet and can be mounted on standoffs in a panel.
- Only six I/O controller boards are available for Scout from Computer Automation:

  1. Serial peripheral   4. General purpose
  2. Paper tape reader   5. Analog input
  3. Paper tape punch   6. Relay peripheral

- Introduced two years after the Naked Mini 4/10 (which until that time was the low end of the Naked Mini 4 family), the Scout offers slightly less performance than the 4/10 on a board about half its size. Scout is priced about 20% below the 4/10 and is positioned to compete with Digital's Falcon, LSI-11/2 and LSI-11/23.
- Although the LSI-11/2 is attractively priced compared to Scout, it is a mature product and not a good choice for new design ins. Neither is the PDP-11/23 box or system a good choice, since it will not be made FCC compliant by Digital. If you are tempted to propose either of these systems in a sales situation because price is the deciding factor, TVG Operations may be able to help.

Naked Mini 4/10:

- Computer Automation introduced the 4/10 to replace its LSI 3/05, which first shipped in 1975, even though the two processors are not software compatible.
- Targeted at its 1977 introduction against the DG microNOVA, TI 990/4 and Digital LSI-11/2, the Naked Mini 4/10 is designed for low-end performance applications such as word processing, intelligent terminals and simple numerical control.

Naked Mini 4/30:

- Computer Automation expects the 4/30 to replace its LSI 2/10 and 2/20.
- Targeted originally to compete with the DG NOVA 3, TI 990/10 and Digital 11/34, the Naked Mini 4/30 is designed for mid-range performance applications such as process control and data acquisition.

Naked Mini 4/90:

- Computer Automation expects the 4/90 to replace its LSI 2/60.
- The Naked Mini 4/90 is targeted at the range from the high end of the Digital 11/34 to the low end of the 11/70.

COMPETITIVE INFORMATION ON DATA GENERAL

COMPANY PROFILE

Background

Data General was formed in April 1968 when Edson de Castro, Henry Burkhardt
and Richard Sogge left Digital Equipment Corporation to start the company.
Their first location was in a Hudson, Massachusetts storefront but they moved
shortly afterwards to Southboro, Massachusetts. Their current Corporate
headquarters location is Westboro, Massachusetts.

In September 1968 the company announced its first product -- a minicomputer
called NOVA. It was the industry's first 16-bit minicomputer. Since that
time the NOVA has undergone several generations and two new product lines have
been introduced: the low-end microNOVA and the high-end ECLIPSE computers.

Since 1981, DG has been structured into three profit-and-loss divisions:
Information Systems (focused on large end users), Small Business Systems
(small end users), and Technical Products (technical OEMs, industrial systems
houses and scientific users). These divisions have full responsibility for
business planning, marketing, product development and profitability in their
assigned areas. DG's salesforce is also divided into three market-oriented
groups: Commercial, Industrial and Government.

Products and Markets

Product Families:

Low End 16-bit		High End 16/32-bit
microNOVA* Family	NOVA Family	ECLIPSE* Family
MBC/1	4/C	S/20
MBC/2	4/S	S/120
MBC/3	4/X	S/130
MP/100		S/140
MP/200		S/250
MPT/100		MV/4000 (32-bit)
		MV/6000 (32-bit)
		MV/8000 (32-bit)

*Technical Products Only

Software:

- microNOVA:
  - DOS - Disk Operating System,
  - MP/OS - Single-User, Multi-tasking, Disk-Based Real Time Operating System

- NOVA:
  - MP/OS - see above
  - RDOS - Real Time Disk Operating System
  - RTOS - Real Time Operating System
  - DOS - Disk Operating System

- ECLIPSE (16-bit):
  - AOS - Advanced Operating System
  - RDOS - Real Time Disk Operating System
  - RTOS - Real Time Operating System

- ECLIPSE (32-bit):
  - AOS/VS - Advanced Operating System/Virtual System

Market Mix:

- 57% OEM, 43% End User for FY81 (Source: Dataquest)
- Geographical split: 69% U.S., 23% Europe, 8% Other
- Total company revenues are split approximately equally among the three marketing divisions

Company Statistics

	1980	1981
Sales	$645 Million	$737 Million
Net Income	55 Million	51 Million
Number of Employees	14,370	14,625

Channels of Distribution

- Direct Sales

- Distributors (established in 1977)

  - Almac/Stroum Electronics
  - Hall Mark Electronics
  - Kierulff Electronics
  - RAE (British Columbia)
  - Schweber Electronics

- Manufacturers Representatives (established in 1981)

  - Spectrum Associates, Boston
  - E.R.A., New York
  - Celtec, Los Angeles
  - Magna Sales, San Francisco
  - T.M.I., Dallas
  - Col-Ins-Co., Orlando, Florida
  - Sumer, Chicago
  - Giesting & Assoc., Cincinnati
  - Phoenix Sales, Ridgefield, Conn.

- Retail Stores

  - The Computer Store
  - The Byte Shop

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microNOVA FAMILY

Product Specifications

PROCESSOR			
Model	microNOVA MBC/1	microNOVA MBC/2	microNOVA MBC/3
Packaging	Single Board Computer	Single Board Computer	Single Board Computer
Maximum Addressable Memory	64KB	64KB	64KB
Speed (Add Time Microseconds)	2.4	2.4	2.4
Cache Memory	No	No	No
DMA Speed (words/sec)	148K – input 173K – output	148K – input 173K – output	148K – input 173K – output
Number of Interrupt Levels	16	16	16
Bus	Separate I/O and DMA	Separate I/O and DMA	Separate I/O and DMA
Number of Instructions	84	84+	84+
Hardware Floating Point	None	None	None
Hardware Mult/Divide	STD	STD	STD
STORAGE			
Floppy Capacity, Min/Max	315K/1.26MB	315K/1.26MB	315K/1.26MB
Hard Disk, Min/Max	10MB/40MB	10MB/40MB	10MB/40MB
COMMUNICATIONS			
Protocols Supported	Async/sync	On-board Async/sync	On-board Async/sync
Network Architecture	Emulate IBM 2780/3780, IBM 360/370, Communicate w/NOVA and ECLIPSE computers	Emulate IBM 2780/3780, IBM 360/370, Communicate w/NOVA and ECLIPSE computers	Emulate IBM 2780/3780, IBM 360/370, Communicate w/NOVA and ECLIPSE computers
SOFTWARE			
Development Tools	MP/OS, DOS	MP/OS, DOS	MP/OS, DOS
Languages	ASSEMBLER, FORTRAN, BASIC	ASSEMBLER, FORTRAN, PASCAL	ASSEMBLER, FORTRAN, PASCAL
FIRST U.S. DELIVERY	May 1978	July 1980	July 1980
PRICE	$800 (min. qty. 5)	$1,200 (8KB memory)	$1,700 (32KB)

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PROCESSOR			microNOVA
Model	microNOVA MP/100	microNOVA MP/200	MPT/100
Packaging	Board/Box System	Board/Box System	Intelligent Terminal
Maximum Addressable Memory	128KB	64KB	64KB
Speed (Add Time Microseconds)	2.4	.84	2.4
Cache Memory	No	No	No
DMA Speed (words/sec)	1M	1.85M	148K – input 173K – output
Number of Interrupt Levels	16	16	16
Bus	Separate I/O and DMA	Separate I/O and DMA	Separate I/O and DMA
Number of Instructions	90	90+	--
Hardware Floating Point	None	None	None
Hardware Mult/Divide	STD	STD	STD
STORAGE			Integral w/
Floppy Capacity, Min/Max	315K/1.26MB	315K/1.26MB	Term. – 716KB
Hard Disk, Min/Max	10MB/40MB	10MB/40MB	12.5MB/25MB
COMMUNICATIONS			
Protocols Supported	Async/sync	Async/sync	Async/sync
Network Architecture	Emulate IBM 2780/ 3780, IBM 360/370, Communicate w/NOVA and ECLIPSE computers	Emulate IBM 2780/ 3780, IBM 360/370, Communicate w/NOVA and ECLIPSE computers	Emulate IBM 2780/3780, IBM 360/370, Communicate w/NOVA and ECLIPSE computers
SOFTWARE			
Development Tools	MP/OS, DOS	MP/OS, DOS	MP/OS, DOS
Languages	ASSEMBLER FORTRAN, BASIC	ASSEMBLER FORTRAN, BASIC, PASCAL	ASSEMBLER FORTRAN, BASIC, PASCAL
FIRST U.S. DELIVERY	February 1979	February 1979	September 1981
PRICE	$1,400 32KB memory (minimum qty. 5)	$2,970 32KB memory	N/A

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Product Weaknesses

1) No Floating-Point Hardware is available within the microNOVA family. The
   LSI-11/2 provides an optional floating-point instruction set while the
   LSI-11/23 has an optional floating-point processor.
2) Large Board Size. The board sizes for the MBC series range from 7" x 7"
   to 7.5" x 9.5" while the MP series are 7.5" x 9.5". In contrast, the
   LSI-11/2, 11/23 and 11/21 Falcon are all packaged on a dual-size board
   measuring 5-1/4" x 8-1/2".
3) Small Installed User Base. Data General does not have a large presence in
   the computer based controller marketplace. According to an International
   Data Corporation Report, in 1980 Data General had only a 6.2% market share
   of microcomputers. In contrast, Digital had a 79% market share of
   microcomputers the same year.
4) Limited Address Space. Maximum address space for the microNOVA is 128KB.
   In contrast, an LSI-11/23 with memory management can address up to 4MB.
6) Limited Complementary Product Offering. Because of Data General's limited
   user base, the extent of complementary third-party products is smaller.
   Digital has many third parties which produce a variety of special purpose
   Q-BUS compatible interface boards.
7) For handling of interrupts, the user's program is responsible for loading
   the address of the appropriate interrupt handler subroutine. In contrast,
   Digital uses a hardware vector interrupt procedure wherein the
   interrupting device provides a hardware wired vector which contains the
   starting address of the appropriate interrupt service routine. This
   imposes less overhead at the interface

Competitive Digital Products

Data General		Digital (Same Performance)		Digital (Same Price)	
MBC/1 SBC w/2KB RAM (min. qty. 5)	$800*	Falcon SBC w/4KB RAM	$790	Falcon SBC w/4KB RAM	$790
MBC/2 SBC w/8KB RAM	$1,200*	Falcon SBC w/4KB RAM	$790	Falcon + MXV11-DC SBC w/4KB and 32KB Multifunction	$1,290
MBC/3 SBC w/32KB RAM	$1,700*	Falcon + MXV11-DC SBC w/4KB and 32KB Multifunction	$1,290	Falcon + MXV11-DC SBC w/4KB and 32KB Multifunction	$1,290
MP/100 32KB (min. qty. 5)	$1,400*	LSI-11/2 + Multifunction (KD11-GC)	$1,390	LSI-11/2 + Multifunction (KD11-GC)	$1,390
MP/200 CPU, 32KB RAM, SLU, Boot, Clock	$2,940*	LSI-11/23 (KDF11-A, MXV11-AC) CPU, 32KB RAM, SLU, Boot, Clock	$2,090	LSI-11/23 (KDF11-AA, MXV11-BF, MXV11-B2), CPU + 128KB, 2 SLU, and Boot	$2,765

*Prices for Quantity 1 from Data Pro, May 1982

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NOVA FAMILY

Product Specifications

PROCESSOR			
Model	NOVA 4C	NOVA 4S	NOVA 4X
Packaging	Box/System	Box/System	Box/System
Maximum Addressable Memory	64KB	64KB	256KB
Speed (Add Time Microseconds)	.4	.4	.4
DMA Speed (words/sec)	630K	1M	1M
Number of Interrupt Levels	16	16	16
Bus	Separate I/O and Memory Bus	Separate I/O and Memory Bus	Separate I/O and Memory Bus
Number of Instructions	39	39	39
Hardware Floating Point	No	Optional	Optional
Hardware Mult/Divide	Optional	Optional	Optional
STORAGE			
Floppy Capacity, Min/Max	315KB/1.26MB	315KB/1.26MB	315KB/1.26MB
Hard Disk, Min/Max	1MB/760MB	1MB/760MB	1MB/760MB
COMMUNICATIONS			
Protocols Supported	Bisync.	Bisync.	Bisync.
Network Architecture	X.25 Xodiac, IBM, BSC	X.25 Xodiac, IBM, BSC	X.25 Xodiac, IBM, BSC
SOFTWARE			
Development Tools	MP/OS, RDOS, RTOS, DOS	MP/OS, RDOS, RTOS, DOS	MP/OS, RDOS, RTOS, DOS
Languages	ASSEMBLER, BASIC, FORTRAN, ALGOL, PASCAL	ASSEMBLER, BASIC, FORTRAN, ALGOL	ASSEMBLER, BASIC, FORTRAN, ALGOL
FIRST U.S. DELIVERY	1979	1979	1979
NUMBER INSTALLED	40,000 all models	40,000 all models	40,000 all models
PRICE (power supply, CPU, front panel and minimum memory)	$3,500	$6,800	$12,000

Product Weaknesses

1) Limited address space. The NOVA 4C and 4S can only address 64KB of memory. The NOVA 4X with memory management is limited to 256KB. In contrast, an LSI-11/23 with memory management can address up to 4MB of memory.

2) Memory management is only available for the NOVA 4X.

3) No memory parity error checking. None of the NOVA family computers provide parity error checking.

4) Multiprogramming capability is only available on the NOVA 4X using mapped RDOS (real-time disk operating system).

5) For handling of interrupts, the user's program is responsible for loading the address of the appropriate interrupt handler subroutine. In contrast, Digital uses a hardware vector interrupt procedure wherein the interrupting device provides a hardware wired vector which contains the starting address of the appropriate interrupt service routine. This imposes less overhead at the interface level.

Competitive Digital Products

Data General	Digital (Same Performance)	Digital (Same Price)
NOVA 4C $3,500* CPU, Power Supply, Front Panel, 32KB Memory	PDP-11/03 $3,100 CPU, Power Supply, Front Panel, 32KB Memory	PDP-11/03 $3,100 CPU, Power Supply, Front Panel, 32KB Memory
NOVA 4S $6,800* CPU, Power Supply, Front Panel, 32KB Memory	PDP-11/23 $6,500 CPU, Power Supply, Front Panel, 128KB Memory	PDP-11/23 $6,500 CPU, Power Supply, Front Panel 128KB Memory
NOVA 4X $12,000* CPU, Power Supply, Front Panel, 128KB Memory	PDP-11/23 $6,500 CPU, Power Supply, Front Panel, 128KB Memory	PDP-11/23-PLUS $10,500 CPU, Power Supply, Box, 512KB Memory

*Prices for Quantity 1 from Datapro, March 1982.

ECLIPSE FAMILY

Product Specifications

PROCESSOR		
Model	ECLIPSE S/20	ECLIPSE S/120
Packaging	Board/Box System	Board/Box System
Maximum Addressable Memory	512KB	512KB
Number of Interrupt Levels	16	16
Bus	Separate I/O and DMA	Separate I/O and DMA
Number of Instructions	102	102
Hardware Floating Point	Optional	No
Hardware Mult/Divide	STD	STD
STORAGE		
Floppy Capacity, Min/Max	315K/4.8MB	315K/4.8MB
Hard Disk, Min/Max	10/1108MB	10/1108MB
COMMUNICATIONS		
Protocols Supported and Network Architecture	RJE80, HASP II, RCX70, X.25, Xodiac, DG/SNA, PG/SNA, SNA/3270, DG/SDLC	
SOFTWARE		
Development Tools	MP/AOS, RDOS	MP/AOS, RDOS
Languages	ASSEMBLER, FORTRAN, BASIC, PASCAL	ASSEMBLER, FORTRAN, BASIC, PASCAL
FIRST U.S. DELIVERY	July 1982	July 1982
PRICE	$3,900 (CPU and 128KB memory board)	$11,000 (256KB) box system

PROCESSOR			
Model	ECLIPSE S/130	ECLIPSE S/140	ECLIPSE S/250
Packaging	Box/System	Box/System	Box/System
Maximum Addressable Memory	1MB	1MB	2MB
Speed (Add Time Microseconds)	.2	.2	N/A
DMA Speed (words/sec)	1.25M	5M	1.25/5M
Number of Interrupt Levels	16	16	16
Bus	Separate I/O and DMA	Separate I/O and DMA	Separate I/O and DMA
Number of Instructions	102	102	102
Hardware Floating Point	Optional firmware	Optional in either firmware or hardware	Optional hardware
Hardware Mult/Divide	STD	STD	STD
STORAGE			
Floppy Capacity, Min/Max	315K/4.8MB	315K/4.8MB	315/4.8MB
Hard Disk, Min/Max	10/1108MB	10/1108MB	10/1108MB
COMMUNICATIONS			
Protocols Supported and Network Architecture	RJE80, HASP II, RCX70, X.25, Xodiac, DG/SNA, PG/SNA, SNA/3270, DG/SDLC		
SOFTWARE			
Development Tools	AOS, RDOS/Mapped RDOS, MP/AOS	AOS, RDOS/Mapped RDOS, MP/AOS	AOS, RDOS/ Mapped RDOS, MP/AOS
Languages	ASSEMBLER, FORTRAN, BASIC, ALGOL, DG/L, PASCAL	ASSEMBLER, COBOL, PL/I, BASIC, FORTRAN, DG/L	ASSEMBLER, FORTRAN, PL/I, BASIC, PASCAL, ALGOL, DG/L
FIRST U.S. DELIVERY	March 1977	November 1979	August 1978
PRICE (CPU, power supply front panel, memory)	$14,715 (32KB)	$19,400 (128KB)	$40,000 (64KB)

PROCESSOR		
Model	ECLIPSE MV/6000 (32-Bit)	ECLIPSE MV/8000 (32-Bit)
Packaging	System	System
Maximum Addressable Memory	4.3GB	4.3GB
Cache Memory	16KB Sys. Cache 1KB Inst. Cache	16KB Sys. Cache 1KB Inst. Cache
DMA Speed (words/sec)	18.2MB CPU to Memory	18.2MB CPU to Memory
Number of Interrupt Levels	16	16
Bus	Separate I/O and DMA	Separate I/O and DMA
Number of Instructions	467	467
Hardware Floating Point	No Floating Point Processor	No Floating Point Processor
Hardware Mult/Divide	STD	STD
STORAGE		
Floppy Capacity, Min/Max	Use any DG disk system up to max. disk capacity	Use any DG disk system up to max. disk capacity
Hard Disk, Min/Max	10/1108MB	10/1108MB
COMMUNICATIONS		
Protocols Supported and Network Architecture	RJE80, HASP II, RCX70, X.25, Xodiac, DG/SNA, PG/SNA, SNA/3270, DG/SDLC	
SOFTWARE		
Development Tools	AOS/VS	AOS/VS
Languages	ASSEMBLER, FORTRAN, BASIC, PASCAL, PL/I, COBOL, DG/L	ASSEMBLER, FORTRAN, BASIC, PASCAL, PL/I, COBOL, DG/L
FIRST U.S. DELIVERY	September 1981	April 1980
PRICE (CPU, power supply front panel, memory)	$87,000 (1MB minimum sys.)	$181,000 (1MB minimum sys.)

Product Weaknesses

1) AOS has a large memory requirement. Minimum memory required for operating
   system is 128KB; in contrast, RSX-11M requires a minimum of 32KB and disk.

2) RDOS is limited to foreground and background tasking.

3) In the MV family (32-bit) the front-end processor places a large overhead
   on the CPU.

4) Software base for DG's 32-bit machine is much smaller than VAX's installed
   user base.

5) DG was late entering into the 32-bit market and has failed to catch up.

Competitive Digital Products

Data General	Digital (Same Performance)	Digital (Same Price)
S/20 $11,000* CPU, 128KB RAM, terminal, 12.5MB Winchester, half bay cabinet	Micro/PDP-11 $9,200 CPU, 256KB, 10MB disk, 800KB floppy, 5-1/2" box	Micro/PDP-11 $9,200 CPU, 256KB, 10MB disk, 800KB floppy, 5-1/2" box
S/120 $24,350* CPU, 256KB RAM, terminal, 12.5MB Winchester, half bay cabinet, AOS operating system and language	11/24 $28,500 CPU, 256KB RAM, 20MB disk, VT100 and software	11/24 $28,500 CPU, 256KB RAM, 20MB disk, VT100 and software
S/130 $14,715* CPU, power supply, front panel, 32KB core memory	11/34A $13,800 CPU, 32KB, 5-1/4" box	11/34A $13,800 CPU, 32KB, 5-1/4" box
S/140 $24,650** CPU, power supply, front panel, 256KB	11/44 $29,300 CPU, 256KB ECC MOS, 2 SLUs, 10-1/2" box	11/44 $29,300 CPU, 256KB ECC MOS, 2 SLUs, 10-1/2" box
S/250 System $166,690*** CPU, 256MB ECC MOS, RDOS, 1MB Fixed Head Disk, 2 terminals, 30 cps printing terminal	PDP-11/70 $168,000 RSX-11M, 512KB ECC MOS, 176MB RP06, tape drive, 2 VT100s, LA120	PDP-11/70 $168,000 RSX-11M, 512KB ECC MOS, 176MB RP06, tape drive, 2 VT100s, LA120

  *Prices from Data Pro, September 1982
 **Prices from Data Pro, March 1982
***Prices from Data Pro, April 1982

Data General	Digital (Same Performance)	Digital (Same Price)
MV/4000 System 32-bit, just announced, no pricing information	VAX-11/730	VAX-11/730
MV/6000 System $172,000**** 1MB ECC MOS, 800/1600 bpi tape, 73MB disk, console, 16 terminals, printer, AOS/VS	VAX-11/750 $172,100 w/1MB ECC MOS, 131MB disk, 8 asynch lines, LA120, VMS, 16 VT100s, 800/1600 bpi tape, printer	VAX-11/750 $172,100 w/1MB ECC MOS, 131MB disk, 8 asynch lines, LA120, VMS, 16 VT100s, 800/1600 bpi tape, printer
MV/8000 System $196,000**** 1MB ECC MOS, 73MB disk, tape, 8 lines, AOS/VS, CRT terminal	VAX-11/780 $219,100 w/1MB ECC MOS, 67MB disk, TEE16 tape, 8 asynch lines, LA120, VMS	VAX-11/780 $219,100 w/1MB ECC MOS, 67MB disk, TEE16 tape, 8 asynch lines, LA120, VMS

****Prices from Data Pro, June 1982

OTHER DATA GENERAL PRODUCTS NOT IN THE CBC MARKETPLACE

Commercial Systems

    CS/10
    CS/20
    CS/30
    CS/40
    CS/50
    CS/60
    CS/70

ECLIPSE Data Systems

    C/150
    C/350
    M/600
    MV/8000

Desktop Business Computers

ENTERPRISE 1000

COMPETITIVE INFORMATION ON GENERAL AUTOMATION

GENERAL AUTOMATION

The Company

General Automation was incorporated in 1967, with headquarters in Anaheim, California. In the fiscal year ending July 31, 1982, 71% of the company's $99 million in sales came from its Computer Group, which designs, manufactures and services minicomputers for industrial data management, machine control and financial communications. The remaining 29% came from the multilayer printed circuit boards and laminates produced by the Components Group. Half the computer sales are to OEMs.

Financial Data

		Fiscal Year Ended July 31,					
		1982	1981	1980	1979	1978	1977
Sales	$M	99	124	125	115	98	84
Earnings (loss)	$M	(4.9)	.123	(14.9)	2.5	6.2	1.9
Per Share	$	(1.90)	.05	(5.90)	.97	2.43	7.5

Outlook

Although sales have been disappointing, the company, which has been under new management since 1980, has reduced its debt significantly and divested itself of subsidiaries not germane to the OEM computer business. The company intends to not only stay in business, but also remain a scrappy, tenacious competitor. However, a new product strategy outlined in the 1982 Annual Report makes it clear that management has decided to invest scarce R&D funds in projects that are commercial rather than industrial. Apparently, in management's view, even a tiny share of the burgeoning white collar computer market has greater profit potential than GA's small but comfortable share of the industrial market. This can only enhance Digital's opportunities in the CBC market.

GENERAL AUTOMATION PRODUCTS AT-A-GLANCE

This section mentions most General Automation products, old and new, whether sold in technical or commercial markets. The purpose is to prepare Digital sales representatives for the product names and jargon likely to be encountered at a GA customer site. More details on the models used in the Computer Based Controller market (specifically Series 900 systems) are given in the following sections.

Computer Model	First Shipment	Total Shipped	Typical Price
SPC-16	1970	11,800	$12,250
GA-16 Solution Series 16/110	1975	11,040	1,775
GA-16 Solution Series 16/220	1976	?	5,400
GA-16 Solution Series 16/230	1980	450	7,650
GA-16 Solution Series 16/240	1980	500	9,250
GA-16 Solution Series 16/440	1975	1,800	12,000
GA-16 Solution Series 16/460	1978	1,000	16,000
GA-16 Solution Series 16/470	1980	150	16,000
GA-16 Solution Series 16/480	1980	300	20,250

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Computer Model	First Shipment	Total Shipped	Typical Price
Series 900 Model 910	1982	?	$ 7,000
Series 900 Model 920	1982	?	9,000
Series 900 Model 930	1982	?	18,000
Series 900 Model 940	1982	?	20,000
Series 900 Model 950	1982	?	21,000
ZEBRA 25	1983	–	16,000

- The GA-16 Solution Series will be replaced by the Series 900. A large body of performance and configuration data on the GA-16 Series has been published. Contact Pat Moran, DTN 225-4878 or (617) 568-4878 if you require this information.

- Models of the Series 900 Family, announced in April 1982, are being marketed heavily by GA sales representatives as replacements for GA-16 systems. As GA's only current industrial product, the Series 900 is the system you will most likely have to propose against at GA customer sites for CBC applications. Specifications of these processors are contained in subsequent sections of this article. GA claims the Series 900 is completely hardware and software compatible with all its previously introduced products.

- ZEBRA 25 is a radical departure for GA in at least two respects:

  - It uses hardware and software developed outside the company (M68000, PICK and UNIX).

  - In the words of GA's 1982 Annual Report, it marks "... our aggressive entry into the expanding world of commercial data processing."

  Certain facts about this new offering are starting to emerge:

  - One configuration has 10MB tape, 35MB Winchester Disk expandable to 280MB, a terminal and 80-column line printer for approximately $16,000.

  - The other configuration has a 10MB Winchester and 500KB floppy for approximately $12,000.

  - Both products use the Motorola 68000 microprocessor and apparently can operate under either UNIX or PICK operating systems.

  - At the present time, ZEBRA systems are hardware and software incompatible with the GA-16 or Series 900, although the company has promised a UNIX option to link ZEBRA and Series 900.

SURVEY OF GENERAL AUTOMATION CUSTOMERS

While conducting a telephone survey of OEMs in the U.S. Computer Based Controller market, TVG's Industrial Marketing Group identified nine General Automation customers who made the following comments:

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Positive Comments About GA	Frequency		Negative Comments About GA	Frequency
Reliable Industrial H/W	5		Company Weak	5
Good Field Service	1		H/W Not State-Of-The-Art	3
Low Cost	1		Poor H/W Field Service	2
H/W Easy To Work With	1		Poor System Software	2
			Poor Software Support	2
			Poor Delivery	1
			High Price	1
			Single Source	1
			Poor Name Recognition	1

It is apparent that General Automation manufactures good industrial hardware, yet their customers are well aware of their vendor's deficiencies.

NOTES ON THE GENERAL AUTOMATION SERIES 900

● The following Specification Chart shows many parameters as "Not Specified." The press releases that accompanied the April 1982 introduction of the Series 900 lacked specific product details and industry publications have had little to report since then. One long-time GA customer said even he was having trouble getting Series 900 information from the vendor. TVG Industrial Marketing will continue to gather available data. An update can be obtained by contacting Pat Moran at DTN 225-4878 or (617) 568-4878.

● Series 900 hardware uses Bit-slice technology and Gate Array Logic Chips.

● General Automation claims Series 900 systems are software, I/O controller and peripheral compatible with all previous GA systems.

● The same processor is used in models 930, 940 and 950. When the boxed 930 is inserted into a single bay cabinet, it becomes a 940. Bolt an add-on enclosure to the left side of the 940 and it becomes a 950.

● Optional Series 900 peripherals include:

  - Western Dypex 10MB fixed and removable disk drive at $6,250
  - 80MB Control Data SMD drive at $18,500
  - 300MB Control Data SMD drive at $25,000
  - Ampex D80 Terminal at $1,200
  - Dataproducts 600 lpm Printer at $11,750
  - Talley 200 cps Serial Printer at $1,975

● Submodel Information:

  - The 910 is intended as a replacement for the GA-16/200, having about 1.2 times the processing power at approximately 12% lower cost.

  - The 920 is 1.5 times faster than the 16/200 at 12% less cost.

  - Submodels 930, 940 and 950, when equipped with optional 1K cache memory, are 2.6 times faster than the 16/200.

  - The 950, with its second cabinet, can accommodate up to 21 expansion slots.

Processor					
Model	910	920	930	940	950
Digital Counterparts:	11/23-PLUS 11/23S	11/23-PLUS MICRO/PDP-11 Professional 350 11/24	11/23-PLUS MICRO/PDP-11 11/24	11/24 11/44	11/44 11/730
Packaging	Box or System	Box or System	Box or System	Single Bay System	Dual Bay System
Maximum Addressable Memory	1MB	1MB	2MB	2MB	2MB
Typical add/subract instruction execution time - microseconds	1.3	1.3	.75	.75	.75
Cache Memory	No	No	Optional, 1K	Optional, 1K	Optional, 1K
DMA Speed, Maximum	<-------------	-----------NOT	SPECIFIED ---	-----------------|------------>	
Number of Interrupt Levels	64	64	64	64	64
Number of Instructions	<-------------	-----------NOT	SPECIFIED ---	-----------------|------------>	
Hardware Floating Point	<-------------	-----------NOT	SPECIFIED ---	-----------------|------------>	
Hardware Multiply/Divide	<-------------	-----------NOT	SPECIFIED ---	-----------------|------------>	

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	910	920	930	940	950
Storage					
Floppy Capacity	<-------------	-----------NOT	SPECIFIED ---	----------------	------------>
Hard Disk, Minimum	10MB	10MB	10MB	10MB	10MB
Maximum on Standard Systems	600MB	600MB	600MB	600MB	600MB
Communications					
Protocols Supported	Asynchronous	Asynchronous	Asynchronous	Asynchronous	Asynchronous
Network Architecture	<-------------	----------NOT	SPECIFIED ---	----------------	------------>
Software					
Development Tools	Control OS	Control OS	Control OS	Control OS	Control OS
Languages	<---------- ASSEMBLER, BASIC, FORTRAN, COBOL -->				
	<---------- PASCAL, UNIX AND 'C' PROMISED BY 12/82 -------------------------------->				
First U.S. Delivery	<-------------	----PROMISED JULY 1982 -->			
Number Installed	Unknown	Unknown	Unknown	Unknown	Unknown
Price	$6,995 w/64KB, chassis, RS232 adapter and console interface	$8,995 w/64KB, chassis, RS232 adapter and console interface	$13,995 with 128KB, chassis, (Submodel 932) $17,950 with 256KB, cache and memory management, and chassis (Submodel 935)	$15,995 with single bay cabinet (Submodel 942) $19,995 with 256KB, cache and memory management, single bay cabinet (Submodel 945)	$16,995 with dual bay cabinet (Submodel 952) $20,950 with 256KB, cache and memory management, dual bay cabinet (Submodel 955)

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DIGITAL VERSUS IBM DISK PRICE/PERFORMANCE UPDATE

Richard Case
X3819 MK02-2/D17
RCS: MK02

In the past year and a half Digital has made numerous disk announcements; IBM has cut prices on some disks (3310, 3340), increased and then reduced prices on other disks (3370, 3375, 3380). This article updates the information provided in Competitive Update Special Issue dated April 27, 1981 and extends that analysis to cover Digital's new disk products -- the RA80, RA60 and RA81. Reference that Special Issue for details on many of the issues discussed in this update.

CURRENT PRICE PER MEGABYTE

Disk Unit	Capacity Unformatted/Formatted		Purchase Price	Price Per Megabyte Unformatted/Formatted	
Non-removable Disks ------					
Digital RA81-EA		1368MB	$50,000		$ 36.55
IBM 3370-B1		571MB	$26,600		$ 46.58
IBM 3375-B1	819MB	650MB	$28,770	$35.13	$ 44.26
IBM 3380-B4	2500MB	2000MB	$71,600	$28.64	$ 35.80
Digital RM80-ZA		248MB	$29,900		$120.56
Digital RA80-AA		121MB	$14,000		$115.70
IBM 3310-B2		129MB	$10,120		$ 78.45
Removable Disks ------					
Digital RA60-AA		205MB	$15,000		$ 73.17
IBM 3340-B2	140MB	112MB	$ 6,020	$43.00	$ 53.75

COST OF OWNERSHIP CALCULATIONS

Disk price performance is traditionally calculated by taking the least costly, highest capacity add-on disk and dividing its price by its capacity as shown in the above table. Several IBM disks are sold quoting unformatted disk capacity. To use them, these disks must be formatted or record blocked. All of the above formatted disks from both Digital and IBM use 512 byte blocks. If the unformatted disks are formatted using 512 byte blocks, the overhead is approximately 20%. The formatted capacity of these disks is shown above. The table lists purchase prices only -- not maintenance and other costs. Full Cost-of-Ownership calculations include the following:

- Hardware purchase prices
- Five-year maintenance charges (less warranty period)
- Tax Rate (50% in the U.S. is assumed)
- Investment Tax Credits (10% in the U.S.)
- Discount rate (15% is assumed)
- Salvage value (zero is assumed)
- Depreciation Method (Accelerated Cost Recovery Method is used)

Therefore, it is a more accurate disk subsystem cost comparison to the customer. The charts in this article will use five-year Cost of Ownership to compare Digital and IBM disk products.

RA80 VERSUS THE IBM 3310 WITHOUT IBM SOFTWARE OVERHEAD

IBM has substantially reduced the price of the 3310 disk since Digital announced newer disk products.

	April 1981		January 1983
IBM 3310 B2	$20,800	==========>	$10,120

IBM has cut the price of this disk by more than 50% in eighteen months. The Competitive Update Special Issue dated April 27, 1981 showed the 3310 disk to be more expensive than the RM80 disk. This is no longer true on a pure price or cost-of-ownership basis compared to either the RM80 or RA80 disks.

RA80 on UDA50 vs IBM 3310 on 4331
COST OF OWNERSHIP OVER 5 YEARS

RA80 ON UDA50

3310 ON 4331

NO IBM OR DIGITAL SOFTWARE OVERHEAD
NO IBM OR DIGITAL DISCOUNTING

DISK SUBSYSTEM COST $K

FORMATTED DISK SPACE IN MB
LATEST DIGITAL & IBM PRICING AS OF JAN. 1983
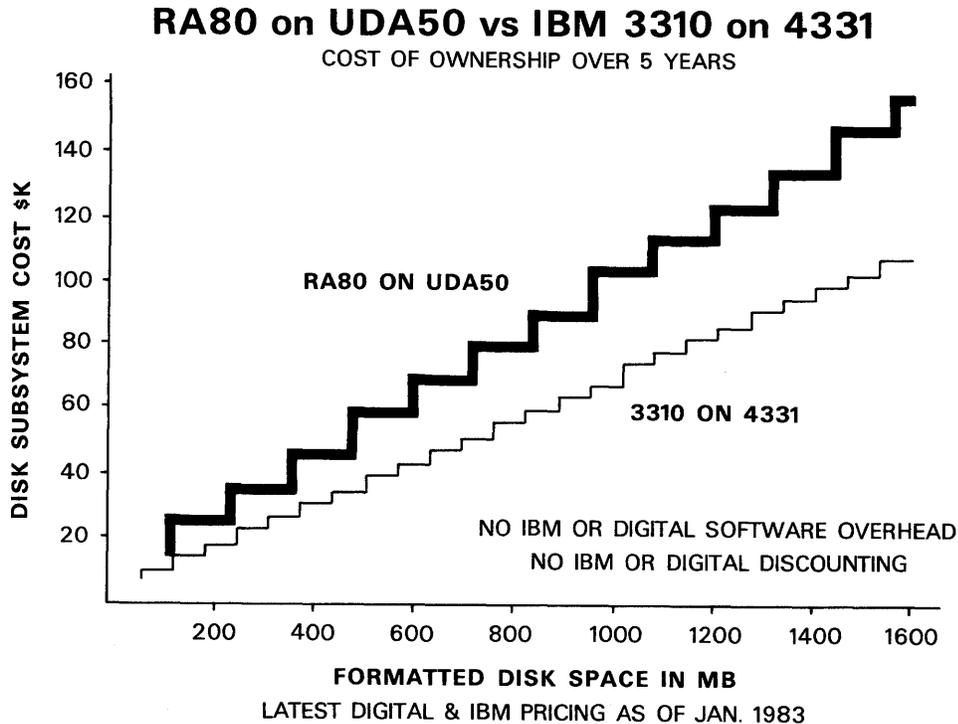
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The previous chart shows both the 3310 and RA80 disk subsystems. The vertical scale is the five-year cost of ownership of all disk subsystem parts, including the controller, string controller and the disks. The horizontal scale shows the subsystem <u>formatted</u> disk capacity. The cost of any software from IBM or Digital is not included in the cost-of-ownership calculation.

The previous chart shows that the 3310, after a 50% price cut, is now less expensive than the RA80. However, the chart does not show differences in how Digital and IBM disk subsystems are configured, how much software overhead they require, IBM file space pre-allocation wastage, or any discounts.

IBM CONFIGURATION DIFFERENCES

All charts in this update show price/performance comparisons of correctly configured, lowest-priced, Digital and IBM disk subsystems with controllers, string controllers (IBM only) and add-on disks.
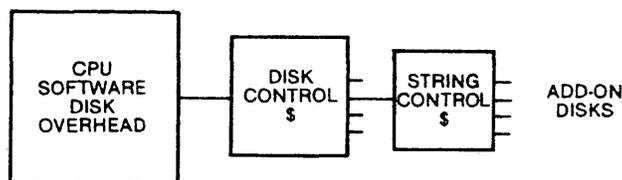
IBM DISK SPACE AND ACCESS ARM OVERHEAD

For performance reasons, IBM 4300 operating system software requires from 125MB to 500MB or more of disk space overhead and from two to eight disk access arms dedicated to operating system files. If any application files share the same disk volumes as the system software, performance will be reduced. The 4300 operating system, which is the most interactive and most comparable to VAX/VMS, is the combination of VM/370 with components of DOS/VSE -- called VM/DOS. VM/DOS requires about 200MB and five disk access arms.

Digital operating systems also require some overhead, but far less than the IBM software. In this analysis, it is assumed that one whole disk will be dedicated to the Digital operating system. This is far more space than we require, but this much is dedicated to make the analysis as conservative as possible.

IBM PRE-ALLOCATION WASTAGE

The IBM operating system file management systems do not dynamically allocate file disk space as much as Digital operating systems do. IBM pre-allocates disk space which wastes substantial amounts of each file disk space. This pre-allocation wastage can vary from 10% to 50% depending on usage. This update will assume a conservative 20% wastage on IBM's part.

IBM DISCOUNTS

IBM does not normally discount their disk drives. Announced IBM discounts cover terminals and the CPU itself, but not the disk drives. IBM has been offering special discounts on the total system in some customer situations. In general, however, they do not discount disk drives. Most larger Digital customers do qualify for a corporate discount which covers disk drives. In this update no discounts are used in calculations for either IBM or Digital.

COMBINATION OF FACTORS

The chart on page 37 of the Competitive Update Special Issue dated April 27, 1981 shows the effects of computing a combination of disk pricing, IBM and Digital software overhead, IBM pre-allocation wastage and Digital discounts. These differences between Digital and IBM have the effect of making the IBM disks less competitive (move up or to the left on the chart) while making the Digital disks more competitive (move down or to the right on the chart).

The Special Issue quotes IBM documents, providing the proof of these IBM and Digital differences.

RA80 VERSUS THE IBM 3310 WITH IBM SOFTWARE OVERHEAD

These issues which differentiate Digital products from IBM's are still very real and are additional Digital customer benefits over price. If these issues are taken into account as shown in the following chart, the RA80 and 3310 are priced on exactly the same price/performance slope.

RA80 on UDA50 vs IBM 3310 on 4331
COST OF OWNERSHIP OVER 5 YEARS

DISK SUBSYSTEM COST $K

RA80 ON UDA50

3310 ON 4331

5 ARMS IBM SOFTWARE OVERHEAD
20% IBM PRE-ALLOCATION WASTE
1 ARM DIGITAL SOFTWARE OVERHEAD
NO IBM OR DIGITAL DISCOUNTS

160
140
120
100
80
60
40
20

200 400 600 800 1000 1200 1400 1600

FORMATTED DISK SPACE IN MB
USER DISK SPACE AVAILABLE FOR FREQUENT RATE OF ACCESS
LATEST DIGITAL & IBM PRICING AS OF JAN. 1983

The RA80 is competitive when compared to IBM's low-end fixed disk.

Few users would purchase more than two or three of these smaller disks before purchasing a larger disk (such as the 3370 from IBM or the RA81 from Digital) because the price per megabyte is much lower.

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The prices shown are for the IBM 3310 disk attached to the 4331 low-performance disk adapter. The 3310 cannot be attached to higher-performance systems such as the 4341. The RA80 and RA81 can be attached both to the UDA50 (which is a better performer than the 4331 adapter) and the high-performance HSC50.

The UDA50 is a very sophisticated state-of-the-art microprocessor disk controller which buffers both disk commands and disk sectors. The IBM 4331 disk adapter microcode cannot be executing at the same time as the 4331 CPU. Thus, this inexpensive disk adapter degrades system performance when I/O traffic increases. This is not true of the UDA50. For this update, the UDA50 will be positioned against the 4331 disk adapter. The high-performance HSC50 will be positioned against the IBM 3880 disk control unit. However, the 4331 disk adapter will not support all of IBM's disks and the 3880 will not support the 3310.

HSC50 COMPARED TO THE IBM 3880 HIGH-PERFORMANCE DISK CONTROLLER

```
          Digital HSC50                              IBM 3880
       .-------------------.                     .-------------------.
       ¦   ¦ Disk Adapter  ¦== Up to             ¦   ¦               ¦
 UP    ¦   ¦---------------¦   4 Disks      UP   ¦ I ¦   Storage     ¦   Up to
       ¦ C ¦ Tape Adapter  ¦== Up to             ¦ B ¦               ¦==  16 Disks
 TO    ¦ I ¦---------------¦   16 Tapes     TO   ¦ M ¦   Director     ¦
   ===¦   ¦  ::  Adapter  ¦==                ===¦   ¦               ¦
 15    ¦   ¦---------------¦                 2    ¦ C ¦               ¦
       ¦ P ¦  ::  Adapter  ¦==                    ¦ H ¦---------------¦
 H     ¦ O ¦---------------¦                 H    ¦ A ¦               ¦
 O ===¦ R ¦  ::  Adapter  ¦==             O ===¦ N ¦   Storage     ¦   Up to
 S     ¦ T ¦---------------¦                 S    ¦ N ¦               ¦==  16 Disks
 T     ¦   ¦  ::  Adapter  ¦==             T    ¦ E ¦   Director     ¦
 S     ¦   ¦---------------¦ 24 Disks       S    ¦ L ¦               ¦   32 Disks
       ¦   ¦ PDP-11/23 CPU ¦ Total               ¦   ¦               ¦   Total
       '-------------------'                     '-------------------'
```

Digital's HSC50 disk controller compares very well with IBM's 3880. While the 3880 supports more disks (32 compared to 24 disks for the HSC50), and also has a disk caching option, the HSC50 has a superior architecture -- an architecture with many multi-tasking microprocessors, very high I/O throughput, and a set of disk storage architectures and protocols. The HSC50 also supports the high-performance TA78 tape drive. The HSC50 can do off-line backups between the disks and tapes attached to it. The host computers order the backup or restore but have no I/O or processing load while the activity is taking place. The IBM 3880 has no such advanced function.

The HSC50 will be compared to the IBM 3880 in this update. All pricing charts show the newly announced 3880 Model 4 in one-to-four disk configurations and the price-reduced (December 1982) 3880 Model 1 in larger configurations. The new 3880-4 cannot be upgraded and only supports up to four expensive string controller disks. Most customers will continue to order the 3880 Model 1. The HSC50 should be positioned against the 3880-1 and not the non-expandable 3880-4.

RA60 COMPARED TO IBM 3340

IBM has reduced the price of the 3340 removable disk by more than 75% over the last year and a half. This disk is now somewhat competitive with Digital's RA60 disk as shown in the following chart. The 3340 disk is no longer under new manufacture by IBM. The disk being sold is a reconditioned used disk.

	April 1981		January 1983
IBM 3340 B2	$26,500	==========>	$6,020

RA60 vs IBM 3340 REMOVABLE
COST OF OWNERSHIP OVER 5 YEARS

DISK SUBSYSTEM COST $K

3340 ON 3880

RA60-HSC50

RA60-UDA50

3340 ON 4331

NO IBM OR DIGITAL SOFTWARE
OVERHEAD OR DISCOUNTS

150   300   450   600   750   900   1050   1200   1350   1500

FORMATTED DISK SPACE IN MB
LATEST DIGITAL & IBM PRICING AS OF JAN. 1983
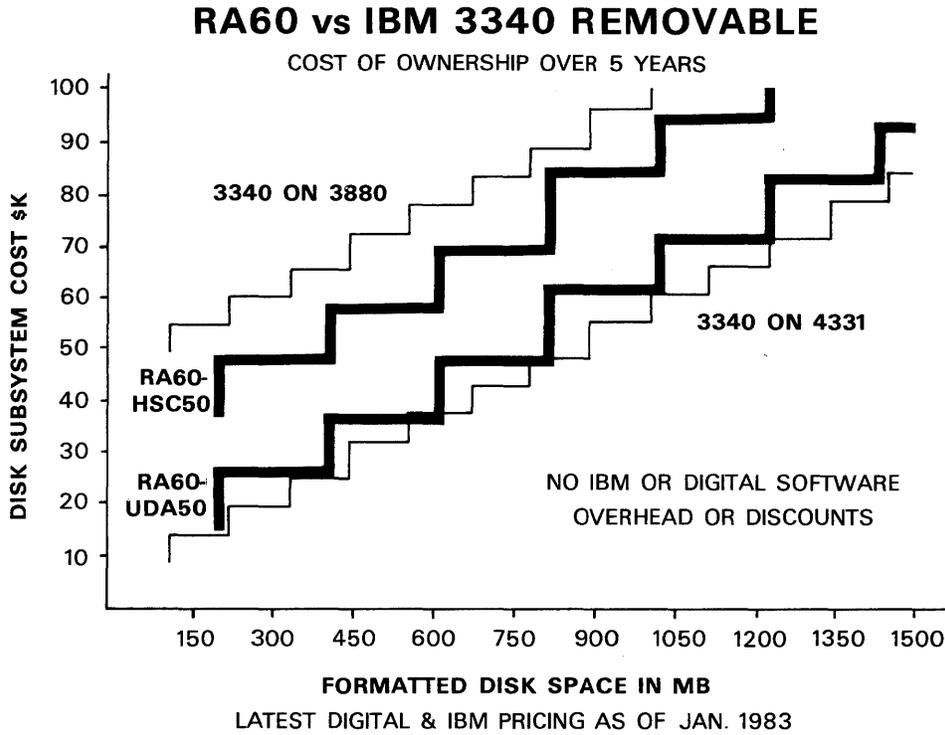
The RA60 removable disk is very competitive compared to IBM's older 3340 removable disk. IBM has not introduced new removable disks in more then eight years. The 3340 disk in the chart above is priced using both the inexpensive 4331 disk adapter and the expensive 3880. The RA60 on the UDA50 is on almost exactly the same price/performance slope as the IBM 3340 on the 4331. However, the RA60 on the high-performance HSC50 is much less expensive than the 3340 on IBM's 3880.

FOR INTERNAL USE ONLY

No IBM or Digital software overhead is shown because removable disks would
generally be added to a system after the operating system software was placed
on fixed disks. Thus, software overhead would not be an issue. No IBM
pre-allocation wastage is shown. This wastage would still apply to the 3340.
If this were shown, the RA60-UDA50 would be somewhat less expensive than the
3340-4331.

The RA60 is very competitive when compared to IBM removable disks.

Digital's large capacity RA81 disk can be compared to IBM's 3370, 3375 and 3380
disks. IBM has raised the price of all of these disks over the last year and
a half. In November 1982, IBM reduced the price of the 3370 and 3375, and in
December reduced the price of the 3380 and 3880-1 control unit.

	April 1981		December 1982
IBM 3370 B1	$27,100		$26,600
IBM 3375 B1	$31,000	==========>	$28,770
IBM 3380 B4	$81,000	.	$71,600
IBM 3880-1	$72,160		$66,970

RA81 ON THE UDA50 VERSUS IBM 3370 ON THE 4331

RA81 on UDA50 vs IBM 3370 on 4331
COST OF OWNERSHIP OVER 5 YEARS

3370 ON 4331

RA81 ON UDA50

NO IBM OR DIGITAL SOFTWARE OVERHEAD

NO IBM OR DIGITAL DISCOUNTING

DISK SUBSYSTEM COST $K

FORMATTED DISK SPACE IN MB

LATEST DIGITAL & IBM PRICING AS OF JAN. 1983
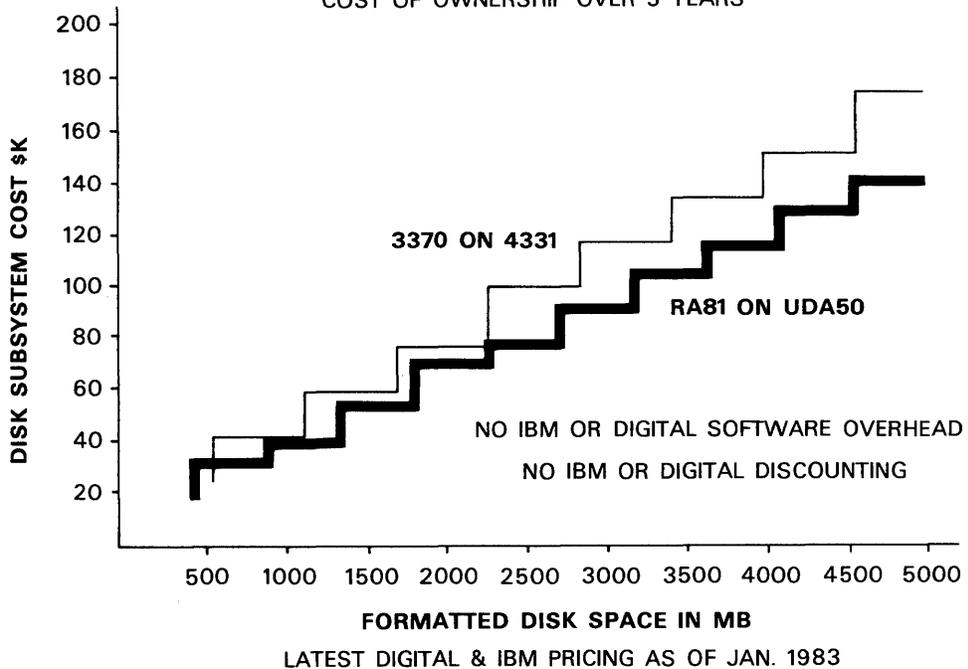
The previous chart shows only the 3370 disk, since this is the only large disk which can be attached to the 4331 disk adapter. Even in this low-cost, low-performance IBM configuration, the RA81 on the UDA50 is substantially less expensive than the 3370.

The RA81's ability to place three disk drives in a 42-inch cabinet is a competitive advantage as well. The RA81-EA/ED cabinet is approximately the same physical size as the cabinet of the 3370-B1 disk. Yet the RA81-EA holds 1,368 megabytes of formatted disk space and the 3370-B1 is 571 megabytes. In many computer rooms, floor space is at a premium. The RA81's packaging can be a significant advantage.

The previous chart does not show any IBM software access arm overhead, IBM pre-allocation disk wastage or Digital discounts. The chart is a straight disk subsystem price/cost-of-ownership comparison.

RA81 ON THE HSC50 VERSUS IBM LARGE FIXED DISKS ON THE 3880
WITHOUT IBM SOFTWARE OVERHEAD

The following chart shows the RA81 on the high-performance HSC50 compared with the three large IBM disk drives which attach to the 3880 control unit. Even with the price reductions on the 3370, 3375 and 3380, and using the non-expandable 3880 Model 1 for the one-to-four disk subsystems, no IBM disk is as competitive as the RA81.

RA81 on HSC50 vs IBM DISKS on 3880
COST OF OWNERSHIP OVER 5 YEARS

Chart: DISK SUBSYSTEM COST $K (vertical axis, 20 to 200) vs FORMATTED DISK SPACE IN MB (horizontal axis, 500 to 5000). Curves labeled: 3380 ON 3880, 3375 ON 3880, 3370 ON 3880, RA81 ON HSC50. NO IBM OR DIGITAL SOFTWARE OVERHEAD OR DISCOUNTING.

LATEST DIGITAL & IBM PRICING AS OF JAN. 1983
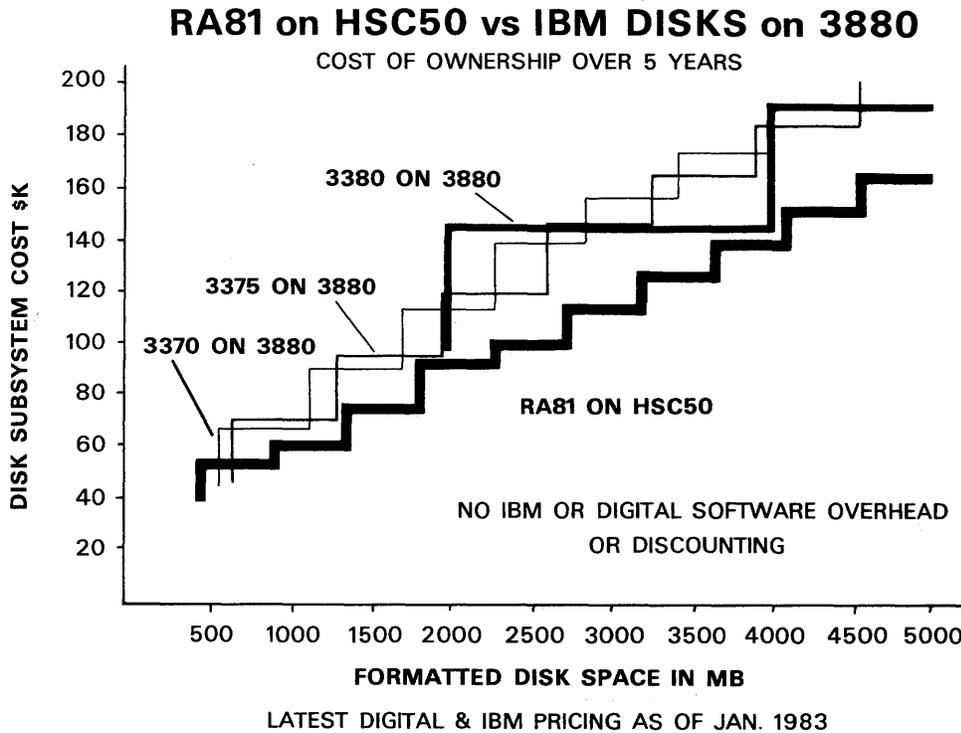
Note that the above chart does not show IBM software overhead or file pre-allocation wastage.

FOR INTERNAL USE ONLY

RA81 ON THE HSC50 VERSUS IBM LARGE FIXED DISKS ON THE 3880
WITH IBM SOFTWARE OVERHEAD

If IBM software overhead and disk space pre-allocation are calculated for
these large IBM fixed disks, following is the comparison between IBM and
Digital's RA81.

RA81 on HSC50 vs IBM DISKS on 3880
COST OF OWNERSHIP OVER 5 YEARS

FORMATTED DISK SPACE IN MB

USER DISK SPACE AVAILABLE FOR FREQUENT RATE OF ACCESS

LATEST DIGITAL & IBM PRICING AS OF JAN. 1983
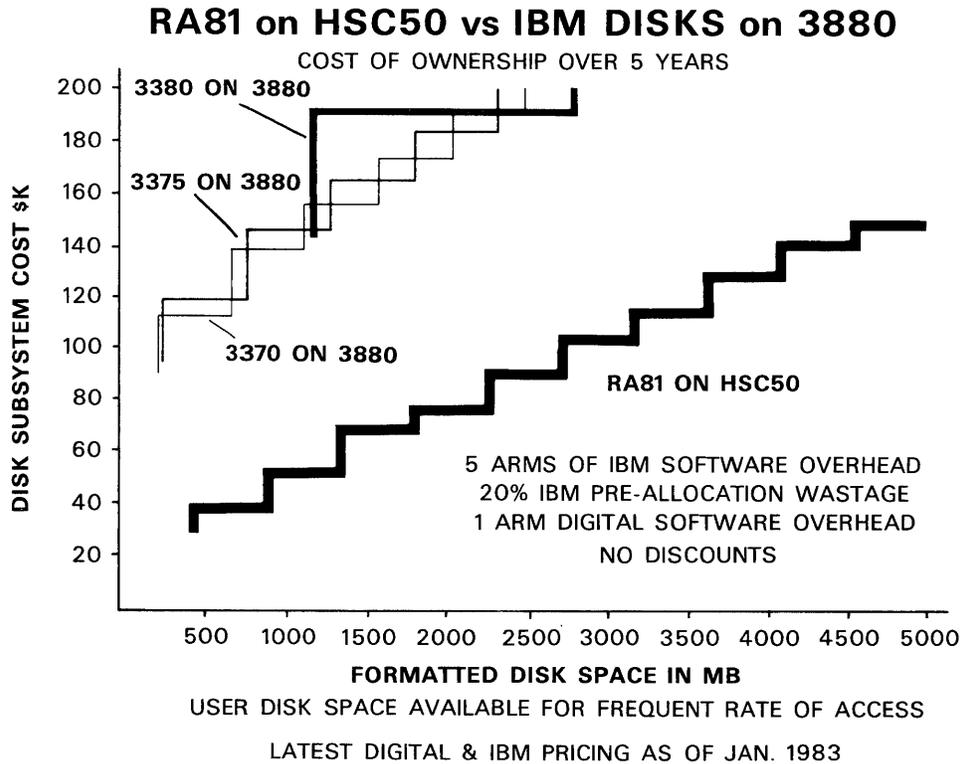
When the real differences between IBM and Digital disk families are compared,
Digital has a very substantial lead over IBM in disk price/performance.

For more information and a detailed explanation of how to configure IBM disk
subsystems, as well as IBM document references for software overhead, etc.,
please reference the Competitive Update Special Issue dated April 27, 1981.
Copies of this update are available upon request from Corporate Sales
Communications at RCS code CSCG, attention Carolyn Smith, referring to Part
Number EJ-N0884-05, or from the author.

SELLING VAX-11 APL TO STSC SITES

Roger Matus
X2343   ZK02-3/Q08
RCS: ZKXX

STSC, Inc. has sold APL*PLUS/2000^{TM} for VAX/VMS sites since spring 1981. We believe that VAX-11 APL, announced in Sales Update Vol. 14 No. 12 dated December 16, 1982, is far superior to APL*PLUS/2000 and that every site should want to convert for the following reasons:

● VAX-11 APL runs two to six times faster than APL*PLUS/2000 on an 11/780 without any changes to the user's configuration. Similar improvements should be expected on other VAX/VMS systems.

● A VAX-11 APL field test site that converted from APL*PLUS/2000 reports that our product is significantly more reliable than APL*PLUS/2000.

● VAX-11 APL is an integral part of VAX/VMS; APL*PLUS/2000 is not. This includes the following features:

   - VAX-11 APL uses the RMS file system with its proven reliability. VAX-11 APL can read and write files that are read and written by other VAX languages. APL*PLUS/2000 uses its own file scheme -- a field test site considered this scheme's reliability to be a weakness of APL*PLUS/2000.

   - VAX-11 APL programs can execute any VAX/VMS system command. The results of a DCL command may be stored in a variable and analyzed using VAX-11 APL. APL*PLUS/2000 has no similar feature.

   - VAX-11 APL uses mailboxes to share data with other running processes. APL*PLUS/2000 has no similar feature.

● VAX-11 APL allows input to be taken from a command file or through the VAX/VMS Batch Control System. Further, output may be directed to a file automatically.

● VAX-11 APL offers a more extensive set of APL features, including:

   - More detailed error messages
   - Replicate
   - Ambivalent functions

There is only one area in which APL*PLUS/2000 has an edge. Today, report formatting (known as "quad f.m.t.") is integrated into the APL*PLUS/2000 interpreter, while VAX-11 APL implements the same functionality via supplied tools. The development team is already working to integrate this functionality into an upcoming release of VAX-11 APL.

^{TM} - APL*PLUS is a trademark of STSC, Inc.

The effort required to convert to VAX-11 APL depends on how well the existing code was written. Both interpreters implement the language primitives in similar ways; however, system functions and file operations differ. If the user isolated these functions, which is good programming technique, the conversion should be relatively easy.

In making the sale, it is recommended that the issues of performance, reliability and file handling be discussed.

ESG POSITION PAPER ON THE HP9000

Aaron Holzer
X5451 MR03-1/E13
RCS:

This paper is intended to help the reader place the newly announced HP9000 family of computers into perspective. Product strategies are investigated particularly as they apply to the ESG product line and Digital as well.

MARKETING STRATEGY

On November 16, 1982, Hewlett-Packard announced the HP9000 family of 32-bit super-minicomputers. Included in the family is what they claim to be the first desktop-sized workstation -- low enough in price to let individual scientists and engineers have their own personal mainframes. It is important to understand HP's strategies so we can locate the holes and sell through them. Remember, as good as the HP9000 sounds when you first hear about it, VAX is the industry leader, especially in CAD/CAM.

It is no surprise that Hewlett-Packard has aimed the HP9000 at the computer-aided-design (CAD) equipment market. These users are typically interested in, and willing to risk using, state-of-the-art technologies. Hewlett-Packard utilized their new 32-bit chip set, which crams 450,000 transistors onto a single chip, to attract these technical users. In addition, scientists and engineers typically need the kind of computing power that the HP9000 can supposedly bring to their desks. Finally, this is the market segment most familiar with the Hewlett-Packard name.

It is important to remind the customer, who believes that the HP9000 is the fastest, most complex, least expensive, most technically superior workstation available, that tomorrow another company will announce a product with even greater capabilities. Discuss architectures with the customer and the importance of compatibility among those architectures.

COMPETITIVE POSITIONING

Hewlett-Packard's positioning of the HP9000 against the competition is interesting. A case could be made that the HP9000 is aimed only at the stand-alone workstations, made by such companies as Apollo Computer, Daisy Systems, Sun Microsystems and many others. However, according to the November 17, 1982 edition of the Wall Street Journal, (Hewlett-Packard) "...considers Digital Equipment to be its chief competitor." The November 29, 1982 issue of Business Week stated that Hewlett-Packard does not plan to directly compete with Digital's VAX line, but rather use "more of an end-run strategy." As their computing needs increased, users would add HP workstations rather than VAX systems. In that sense, Hewlett-Packard could erode our VAX-host base by decreasing the need to add VAX systems at a user's site. (This is similar to the approach Apollo Computer is taking in competing with VAX.) Whether Hewlett-Packard is aiming at the workstation manufacturers or at minicomputer manufacturers, they will still have a major impact on Digital's business.

NETWORKING STRATEGY

Hewlett-Packard is trying to simplify the problem of connectivity for their end users by providing a wide variety of communications options for their workstations. Both Ethernet and an IEEE-802 interface will be supported by the HP9000. However, remember that Ethernet describes only the lowest level protocols of inter-device communications. Their support of those standards simply implies that they can share a wire. Even this may not be beneficial to Digital since it allows Hewlett-Packard to reach into our space, where VAX has become the de facto standard for engineering computing.

Our strategy must focus on DECnet and the newly announced Computer Interconnect (CI). Hewlett-Packard may discuss clusters of HP9000 workstations, all of the same capacity, as viable alternatives to large computer systems. However, the Digital concept of a VAX cluster will certainly overshadow the HP concept since it allows machines of different capacities to be connected as user needs dictate. Connecting three machines, each of which is claimed to be 33% of a VAX-11/780, will not provide the capabilities of that system.

APPLICATIONS SOFTWARE STRATEGY

The software aspects of the HP9000 family have been a major focal point of the product announcement. Both operating system's software and applications software have been emphasized. The software includes some Hewlett-Packard proprietary packages, as well as software that will be available from third-party vendors. Hewlett-Packard realizes that a major VAX family strength has been the software quality and quantity. They realize that VAX has a five-year headstart in building an applications base and have set up an aggressive program to attract third-party software packages. Hewlett-Packard has contracted with Softool Corporation to provide a FORTRAN conversion package which will reduce the time and effort associated with converting both Digital and IBM packages to the HP9000. They hope this package will allow them to bridge the five-year headstart now held by VAX. Digital still has an advantage in that many of the packages on the VAX were written especially for it and are highly optimized for the VMS environment. Thus, conversion programs may increase their applications base, but will never close the wide gap.

Hewlett-Packard has chosen a UNIX derivative as its primary operating system. The UNIX versus VMS discussion is typically highly emotional and fruitless. There are many versions of UNIX on the market, not all of which are compatible. Some care should also be taken in evaluating the HP9000's abilities to run UNIX. The stack architecture and paging mechanisms of UNIX may not be well suited for the HP9000 system. Large programs may suffer degradation as a result of this. Hewlett-Packard specifies that all operating system related software must be resident in RAM. The memory-resident portion of the HP-UX (UNIX) operating system alone is 1MB. This must be factored into the sizing of an HP9000 workstation.

Unlike Digital, Hewlett-Packard is releasing three proprietary packages. They will sell a mechanical design package for $15,135, a finite element analysis package for $12,110 and an interactive version of SPICE (a circuit simulation package) for $5,000. All prices are for single-user licenses. The fact that the packages are called proprietary may impress some people. That by itself does not make them any better than other packages available on VAX.

PRICING STRATEGY

One of the most critical issues to Digital will be overcoming the pricing structure of the HP9000 as presented to the press. The price range has been reported as starting at $28,250 for a desktop model. Hewlett-Packard expects to begin volume shipments of the single-processor systems in March 1983. There are no committed dates for any of the software which will be on the systems. The only timeframe being given is "early 1983." HP-UX is not expected to be available until summer 1983.

The fact that at that price ($28,500) the HP9000 did not include any hard disk, had only one-half MB of memory and absolutely no software, did not prevent the press from comparing it to a fully supported VAX with 1MB of memory, 121MB of hard disk, 10MB of removable disk and VMS support. A minimal single-user HP9000 system -- the 9020S -- with an additional megabyte of memory would cost $52,045, almost double the minimum quoted.

In certain instances it may be appropriate to sell Professional 350 systems against the HP9000, especially when you compare disk size and graphics capabilities (the 12" black and white monitor is only 560 x 455, hardly qualifying as high resolution). In most cases, however, a dual RL02-based VAX-11/730 system with a VS100 high-resolution workstation should be proposed as a price competitive alternative to the HP 9020S, which is priced at $52,045 with the additional MB of memory. VAX, with a right-to-copy license, would be priced at $39,500 for the system and $14,250 for the VS100 hardware and software, bringing its total price to $53,750.

SUMMARY

With the new HP9000 family's available software, connectivity capabilities and pricing structure, Hewlett-Packard seems to have put together a formidable set of products and strategies to compete with VAX. Computers sales have already surpassed instrument sales at Hewlett-Packard. As the second largest mini-computer manufacturer in the world, they must be considered as a significant adversary, especially now that they seem to be concerned with market share.

However, we must not over-react to every new product announced by our competitors. It is important to remember that Digital sells a family of compatible VAX/VMS products and with our interlocking architectures in workstations, networking and data management, we have the strongest and broadest product range available to solve the engineer's problems -- today and tomorrow.

DP CONFIGURATIONS DATABASE DOCUMENTATION AVAILABLE

Richard Case
X3819 MK02-2/D17
RCS: MK02

The following competitive document is available upon request:

<u>The Data Processing Configurations Database</u>

This document is 3/4" thick, double sided and contains detailed system configurations from single-user personal computers to 500-user IBM 3084 systems. Almost all of the IBM product families are included: 4300s, S/38, S/1, S/23, 8100, PCs, S/34, 308Xs, along with the Wang VS family, and Digital's VAX, PDP-11 and Personal Computers.

Each configuration is priced using purchase price, rental, lease, full service, basic service and no services. Configurations were contributed by Donna Graves, Peter Parsons, Ken Gontarz and myself. Input on other competitors would be welcomed.

The document is designed to be a reference tool for the salesforce, product management and marketing. This document was distributed to Sales Unit Managers in January at the Sales Symposium. Contact your sales manager to view this reference document. If your Sales Unit Manager does not have a copy, contact Dawn Thomas at DTN 264-3817 or send a memo requesting this document. If you would like to be on the mailing list for future (approximately every six months) versions of the Configurations Database, please ask to be added to the distribution list.

IBM AND WANG ROUGH QUESTIONS VIDEO TAPE

Richard Case
X3819 MKO2-2/D17
RCS: MKO2

A new competitive video tape is now available for distribution. The IBM and
Wang Rough Questions Video Tape was prepared for training sessions for the
OFFICE 1 sales meeting held in September 1982. The two workshops proved to be
very popular and informative about how to handle the difficult questions asked
by customers when the competition is either IBM or Wang. The video tape can
be used as a sales unit training session or for district or other meetings.
While the subjects discussed are focused on the Office market, some are
pertinent to any sales situation.

ORDERING INFORMATION

Contact Corporate Sales Communications, referring to the appropriate order
number(s) and complete title given below. Provide your name, cost center,
badge number and complete corporate location/mailstop. Your order must be
verified via EMS or RCS communication to Gary Buegel at RCS code CSCG.

Order numbers:

| EE-16553-05 | IBM and Wang Rough Questions 3/4" Video Tape | $200 |
| EE-16554-BX | IBM and Wang Rough Questions 1/2" Video Tape | $200 |

Other Competitive Presentations:

EF-16508-05	Digital Office Architecture Slide Show	$200
EG-16508-05	Digital Office Architecture Script Only	NC
EA-16508-05	Digital Office Architecture Tape Only	NC
EJ-23795-17	Digital Office Architecture Color Poster	NC
EF-16509-05	Digital Office Architecture Compared to IBM	$200
EG-16509-05	IBM Script Only	NC
EA-16509-05	IBM Tape Only	NC
EF-16510-05	Digital Office Architecture Compared to Wang	$200
EG-16510-05	Wang Script Only	NC
EA-16510-05	Wang Tape Only	NC
EE-16393-05	IBM PROFS versus DECmail 3/4" Video Tape	$300
EE-16394-BX	IBM PROFS versus DECmail 1/2" Video Tape	$300
EF-16278-05	Digital vs. IBM, Information Management	$200
EF-16245-05	Digital vs. IBM Disks (Not RA81 or RA60)	$200

The following presentations are out of date and will soon be unavailable for
distribution:

| EF-16277-05 | Office of the Eighties: Digital vs. IBM | $200 |
| EF-16278-05 | Office of the Eighties: Digital vs. Wang | $200 |

FOR INTERNAL USE ONLY

COMPETITIVE NEWS

Kristine Carpenter
X4274 UP01-4
RCS: TPGM

PRODUCT ANNOUNCEMENTS

Personal/Desktop Computers

FRANKLIN COMPUTER CORPORATION has introduced an upgrade of its ACE 1000 called the 1200. It utilizes the same microprocessor and keyboard as the 1000, but includes one or two Shugart 5-1/4 inch, 143K byte disk drives. The machine will also be available with a CP/M card, allowing it to run CP/M-based software. Pricing varies per configuration; a one disk machine equipped with the CP/M card and a card doubling display capability is listed at $2,495. Production began in January.
(EN, December 6, 1982; p. 46)

In other news, FRANKLIN COMPUTER reduced the list price of the ACE 1000 from $1,595 to $1,300.
(CW, November 22, 1982; p. 63)

HARRIS has integrated personal computing power into its Model 9200 CRT. The 9200, with two 8-inch Mbyte floppy disks, 64K RAM and CP/M, is priced at $6,200. The 9200 with the option will be available in March.
(EN, December 6, 1982; p. 30)

TELEVIDEO announces its first microcomputer based on the 68000 microprocessor. The Telesystem II will run on the UNIX III operating system at a price of $14,000. The system includes 512K bytes RAM, a 40 Mbyte Winchester disk from Quantum Corporation, a 17.5 Mbyte cartridge type drive manufactured by Data Electronics, as well as two Televideo CRTs. The system will support up to 16 users with its internal memory expandable to one Mbyte. The Telesystem II will be available in March.
(CSN, November 29, 1982; p. 26)

ONTEL CORPORATION, a manufacturer of user-programmable CRTs, has introduced the Amigo, an 8-bit, Z80A-based, 64K RAM system. Targeted at the single-user business environment, Ontel is attempting to increase their OEM business. Discounts range between 33% and 40% off the $2,395 list price.
(CSN, November 8, 1982; p. 30)

COMPUTER DEVICES INC. (CDI) now has a 16-bit personal computer. The Dot, available in four models, combines the portability of an Osborne I with the functionality of the IBM PC. Weighing 26 pounds, it has an 8088 CPU and MS-DOS operating system. The basic configuration is 32K bytes of memory and can be expanded to 246K bytes. Other features include a detachable keyboard and 5 x 9 inch screen. A Z80 option is available to run CP/M. Prices range from $2,995 to $3,995.
(CSN, November 8, 1982; p. 32)
(EN, November 8, 1982; p. 35)

COMPAQ CORPORATION, a new corporation formed by two former TI executives, has also announced a portable IBM compatible personal computer. At 28 pounds its vital statistics include 128K bytes RAM, 320K byte disk drive, 9-inch screen and three memory expansion slots. Pricing not available.
(IW, November 8, 1982; p. 5)

CONVERGENT TECHNOLOGIES has upgraded its microcomputer line to include color graphics capability. The AWS Turbo Color Graphics Workstation uses the NEC 7220 graphics chip and comes with 256K bytes memory, 128K bytes of graphics dedicated RAM, 15-inch display and a fully programmable keyboard. Prices range from $12,198 to $13,790. This announcement comes two months after Convergent increased the speed of the AWS line by switching from the 8/16-bit 8088 chip to the 16-bit 8086.
(CSN, November 8, 1982; p. 10)

NCR CORPORATION's Tower 1632 microcomputer is now available. The microprocessor is based on the Motorola 68000 and operates under the UNIX System III. Features include a main memory of 256K bytes expandable to 2 Mbytes, with a 10 Mbyte Winchester disk and 1 Mbyte 5-1/4" floppy disk. The system accommodates up to 16 users and is priced at $12,000.
(CSN, November 8, 1982; p. 18)

ALTOS COMPUTER SYSTEM introduced a 5-user, 16-bit microcomputer. The 586 has 256K bytes memory expandable to 512K and can use MS-DOS, PICK, CP/M-86 or the MP/M-86 operating systems. With two 5-1/4" floppies, it is priced at $4,990; a system with a 10 Mbyte Winchester is $7,990.
(EN, November 15, 1982; p. 24)

EPSON, an RO printer supplier, has enhanced its product line with the introduction of two microcomputers. The HX-20 weighs just four pounds and measures 8-1/2 by 11 inches. Based on the CMOS 8-bit 6301, the unit has 16K RAM expandable to 32K and 32K ROM expandable to 64K. Other features include a 20 character by 4 line LCD and a 24-column dot matrix printer. The HX-20 is listed at $795.

QX-10, Epson's other entry into the microcomputer market, is an 8-bit CP/M machine with 64K or 128K RAM expandable to 256K. Epson feels its system sets apart from other desktop computers because no operator training is required. It is priced under $3,000.
(IW, November 8, 1982; p. 53)

ONYX has expanded its microcomputer line with the addition of three 16-bit machines with UNIX operating systems. All are based on the Zilog Z8000 microprocessor. The Sundance-16 ranges in price from $12,990 for a five-user system with a 7 Mbyte disk drive and 256K bytes RAM to $15,990 for a 21 Mbyte system with 512K bytes RAM.
(CSN, November 22, 1982; p. 68)

TELEVIDEO has expanded its product line with two new 8-bit and two 16-bit small business systems. All four systems operate on CP/M. The 8-bit machines utilize the Z80A microprocessor. With respect to memory the machines have 64K bytes of RAM expandable to 128K bytes. The 16-bit machines are supported by the Intel 8088 microprocessor and include 128K bytes of memory expandable to 256K bytes. Prices range from $1,500 to $3,500 with first customer ships in January.
(CSN, November 22, 1982; p. 66)

Video

ITHICA INTERSYSTEMS introduced the Graphos, a color graphics terminal capable of displaying and modifying 16 windows. The terminal has a resolution of 640 x 480 pixels. Other features include 32,000 colors; shading, texturing and cross hatching; pan, zoom and overlay for each window; as well as multiple fonts. The Graphos is said to be priced under $8,000.
(CW, December 6, 1982; p. 67)

BEEHIVE has expanded its product offering to include a smart CRT. The ATL-008 will be the first in a series of CRTs utilizing the 68008, 16-bit chip from Motorola. The firm plans to unveil a microcomputer utilizing the same chip at NCC. Priced at $1,395, the terminal's features include 32K bytes of RAM expandable to 128K bytes, 16 programmable function keys, 14-inch tilt/swivel display and detachable low-profile keyboard. Volume shipments are scheduled for March.
(CSN, November 8, 1982; p. 16)
(EN, November 8, 1982; p. 26)

COLORGRAPHICS COMMUNICATION CORPORATION has expanded its family of color graphic terminals with two new products. The 813 and 819 have 13 and 19-inch screens respectively and emulate Intelligent Systems Intecolor 8301G and 8001G terminals. The 813 and 819 also have as standard four split screens and a transparent mode for software development. The 813 lists at $3,000, with the 819 listed at $3,500.
(CSN, November 8, 1982; p. 26)

ADDS has entered the IBM 3270 compatible market with its recent addition to the Viewpoint line. Believing the ASCII terminal market has slowed down, ADDS hopes their Viewpoint/78 will increase their CRT market share. The terminal will be sold primarily through distributors; deliveries were scheduled for January.
(CSN, November 8, 1982; p. 16)

INFORMER COMPUTER has introduced a series of IBM compatible terminals. Available in December at approximately $2,000, the Informer 370 series terminals are said to be 80% smaller and 60% lighter than IBM's 3278 terminal.
(CW, November 15, 1982; p. 51)

QUME, manufacturer of the Sprint family of daisy wheel printers, has now thrown its hat into the video market ring by introducing three general-purpose terminals. Specifics include:

● The Model 102, a basic editing terminal priced at $695, with units available in January.
● The Model 108, priced at $895, will have the Model 102 features plus 7 additional programmable keys. Production is scheduled for mid-February.
● The Model 103, at the same price as the 108 ($895), is targeted at the ANSI X3.64 market.

(CSN, November 22, 1982; p. 7)

RADIO SHACK, aiming at the IBM 3270-compatible market, now has available a communications controller which enables the TRS-80 models to communicate with IBM hosts. The price of the T-76 ranges from $4,500 for three ports to $7,000 for seven ports.
(EN, November 15, 1982; p. 35)

Printers

MICRO PERIPHERALS has expanded its Printmate 150 line of dot matrix printers, adding four new models. All four machines operate at 150 cps; they can, however, be differentiated on the basis of buffer sizes, which range from 2K to 16K bytes. A 2K buffer machine lists at $995, while a printer with a 16K buffer is $1,095.
(CSN, November 29, 1982; p. 48)

COMPUTER TRANSCEIVER SYSTEMS (CTS) announces a 120 cps printer called The Execuport 4120. The 4120 has two character fonts resident in the machine and is multiprocessor based. CTS also introduced the 4120 BSR which has buffering and editing capabilities, six additional commands and a 16 element columnar printhead. The price for the 4120 is $3,295; the BSR models with 11K and 43K bytes memory list for $3,295 and $3,995 respectively.
(CW, December 6, 1982; p. 66)

ANADEX has enhanced its DP-9620A dot matrix printer. The new DP-9624A operates at 200 cps in draft mode, 50 cps in correspondence mode and an intermediate quality mode of 100 cps. The price is $1,995.
(EN, November 15, 1982; p. 82)

DATA TERMINALS AND COMMUNICATIONS (DTC) has announced a daisy wheel printer said to be software compatible with the Diablo Models 1640, 1630 and 630. The DTC 380Z, as it is called, has a 48K byte buffer and prints at 32 cps. It is priced at $1,199.
(CW, November 22, 1982; p. 64)

SOFTWARE NEWS

A new version of the UNIX operating system will be available from AT&T in the first quarter of this year. The newest version V is said to have improved performance in all areas including text processing, screen editing and file system maintenance.
(EN, November 22, 1982; p. 30)

PRODUCT CHANGES

CENTRONICS has abandoned its efforts to produce the Quietwriter, after spending three years and $10 million on development. At one time Centronics considered the Quietwriter one of its most important future products. However, the firm now feels that the office automation market, where the Quietwriter was to be positioned, is served with its 350 Series.

The Quietwriter was to utilize a new technology -- a print stylus which would write on the paper rather than strike it. This is the third time Centronics has discarded a new technology; involvement with ink-jet and laser printing were previously dropped.
(CSN, November 22, 1982; p. 4)
(EN, November 22, 1982; p. 26)

PRICING INFORMATION

CODATA SYSTEMS has taken an unusual approach to pricing its Codata 3300 micro-computer. The system will be available for one price per unit regardless of the number of units purchased. By using a one price strategy, the distributor will not be committed to a certain volume of terminals. Codata feels this is an advantage since small buyers will get the same price as the larger accounts. Codata management also feels this will distinguish them from the wide array of competitors and will eliminate a great deal of confusion.
(IW, November 29, 1982; p. 11)

PRINTEK has reduced the price on its entire 900 series of dot matrix printers. The 910, a 200 cps machine, is down 21% to $1,595; the 340 cps Model 920 is now priced at $2,395, a reduction of $200.
(CW, November 22, 1982; p. 62)
(EN, November 29, 1982; p. 30)

ZENITH DATA SYSTEMS has reduced the prices of its Z89 and Z90 8-bit desktop computers. The Z89 was reduced from $2,895 to $2,499, while the Z90 dropped its price from $3,195 to $2,799.

In addition, Zenith cut the prices on the Z25 and Z125 dot matrix printers to $1,499 from $1,595.
(EN, November 22, 1982; p. 17)

MARKET TACTICS/TRENDS

ADVANCED RESOURCE DEVELOPMENT (ARD) estimates that by 1986 the desktop computer market will be at $3 billion, resulting in a five-year compound growth rate of 47% from the $440 million achieved in 1981. Though single-user systems will grow at a healthy 25%, ARD believes multi-user systems will see a significant increase, expanding from 14.2% of the total PC market to 28.9%.
(CSN, November 22, 1982; p. 97)

INTERNATIONAL RESOURCE DEVELOPMENT (IRD) estimates that the European personal computer installed base will grow from 1.7 million units in 1982 to 18 million by year end 1985. IRD estimates IBM will dominate with a high market share once its personal computer is officially introduced to Europe.
(CSN, November 22, 1982; p. 36)

FORTUNE SYSTEMS CORPORATION is said to be contemplating an expansion of its product line with a low-end version of its 32:16, built around the Motorola 68008 8-bit microprocessor. Fortune will market the 8-bit machine primarily in Europe, where demand is especially strong.
(CSN, November 22, 1982; p. 4)

HEWLETT-PACKARD, with its recent introduction of the 100 and 200 series of personal computers (reference Competitive Update Vol. 2 No. 5 dated January 17, 1983, Terminals Group article), is aiming for a three-way market segmentation: 1) Fortune 1000 professionals as end users, reached through the HP salesforce, 2) small businesses and 3) individual professionals. The latter two groups will be reached through retail stores.

HP is targeting primarily at those professionals in manufacturing, capitalizing on the HP personal computers for factory automation. Secondary emphasis will be placed on office automation.
(Electronic Business, November 1982; p. 85)

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DISTRIBUTION CHANNEL NEWS

OKIDATA, to put it simply, wants more dealers. In order to achieve that objective, their efforts have been dedicated to improving the quality of service they provide their dealers. A retailer-oriented salesforce has been created and Okidata is working more closely with its distributors. Okidata feels the addition of the Model 92 to the Microline series of matrix printers will help its cause by enhancing its retail offering. The printer operates at 160 cps and lists for $699.
(IW, November 29, 1982; p. 18)

ORGANIZATIONAL ANNOUNCEMENTS

CONTROL DATA CORPORATION'S capital division (CDCC) has purchased 21% of STAR COMPUTERS. A software manufacturer, Star wants the additional funds to expand marketing efforts on its CP/M-based financial management and account packages. CDCC sees software as an area of fast growth and a solid investment.
(IW, November 29, 1982; p. 20)

VICTOR TECHNOLOGIES has been awarded the contract to supply Ford Motors with its Victor 9000 microcomputer. The contract is three years in length, with volumes anticipated at 1,500 to 3,000 units the first year. Ford, by virtue of this contract, becomes one of the first large corporations to select a microcomputer for company-wide use.
(EN, December 6, 1982; p. 18)

VICTOR'S parent company -- KIDDE -- has recently acquired 80% of SIRIUS SYSTEMS. SIRIUS is the Victor 9000 OEM supplier.
(EN, November 15, 1982; p. 24)

GENERAL ELECTRIC has been awarded a one-year, $3 million contract to supply ITT Courier with 2,500 printers. GE will supply a customized version of its Model 3240, a 240 cps machine capable of printing six copies.
(EN, December 16, 1982; p. 18)

TAB PRODUCTS has signed a $4 million contract to provide CRTs to Prime Computer. Tab will provide 3,000 of its Model 132/15, to be incorporated into Prime minicomputers.
(CSN, November 8, 1982; p. 16)

DATAPRODUCTS CORPORATION has agreed to purchase Integral Data Systems. A privately held firm, Integral Data is a producer of 110 and 200 cps color matrix printers. The acquisition will allow DataProducts to complement its product line which currently consists of 140, 180 and 340 cps serial matrix printers.
(EN, November 15, 1982; p. 14)

Two CRT manufacturers have combined forces -- VISUAL TECHNOLOGY has agreed to purchase ONTEL for $12 million. To date terms have not been disclosed.
(EN, November 22, 1982; p. 22)

References
CSN - Computer System News
EN - Electronic News
IW - ISO World
CW - Computer World
Electronic Business

IBM PRICE REDUCTIONS

Richard Case
X3819 MK02-2/D17
RCS: MK02

This article presents a detailed account of the price reductions IBM announced on October 20, 1982. (Reference Competitive Update Vol. 2 No. 4 dated December 13, 1982, IBM Price Decrease article, p. 13.)

SAMPLE 4300 PRICE REDUCTIONS

		Old Price	New Price	Difference	%
CPUs ---					
4321	1MB	$ 85,000	$ 64,000	$ 21,000	24.7%
4341-10	2MB	$178,000	$150,000	$ 28,000	15.7%
4341-2	16MB	$578,800	$470,000	$108,800	18.8%
4300 Memory per MB*		$ 15,700	$ 10,000	$ 5,700	36.3%
Disks ---					
3310-A1	65MB	$ 10,710	$ 6,960	$ 3,750	35%
3340-A2	114MB	$ 24,570	$ 8,600	$ 15,970	65%
3370-A1	571MB	$ 44,350	$ 35,480	$ 8,870	20%
Tapes ---					
3411-3	50 ips	$ 15,890	$ 11,910	$ 3,980	25%

*IBM memory pricing on the 4300 has dropped from $15,700 per megabyte to $10,000. This results in most of the price reductions for the 4300 processors, since memory is packaged with the CPU. This memory price compares to Digital's undiscounted price of $5,000 per megabyte for VAX 64K bit memory (MS750-CF).

Twenty 4300 systems ranging from the 4321 to the 4341-2 were priced using both the new and old IBM price list. The results follow:

System Level Price Analysis	Hardware Purchase Charges	Monthly Maintenance Charges	Five-Year Software Charges	Five-Year Cost of Ownership
4331 Family	-14.8%	+1.4%	+1.3%	-10.7%
4341 Family	-9.5%	-2.0%	+.6%	-6.7%

The price reductions have little effect on hardware maintenance and software charges, but is significant on hardware purchase and cost of ownership.

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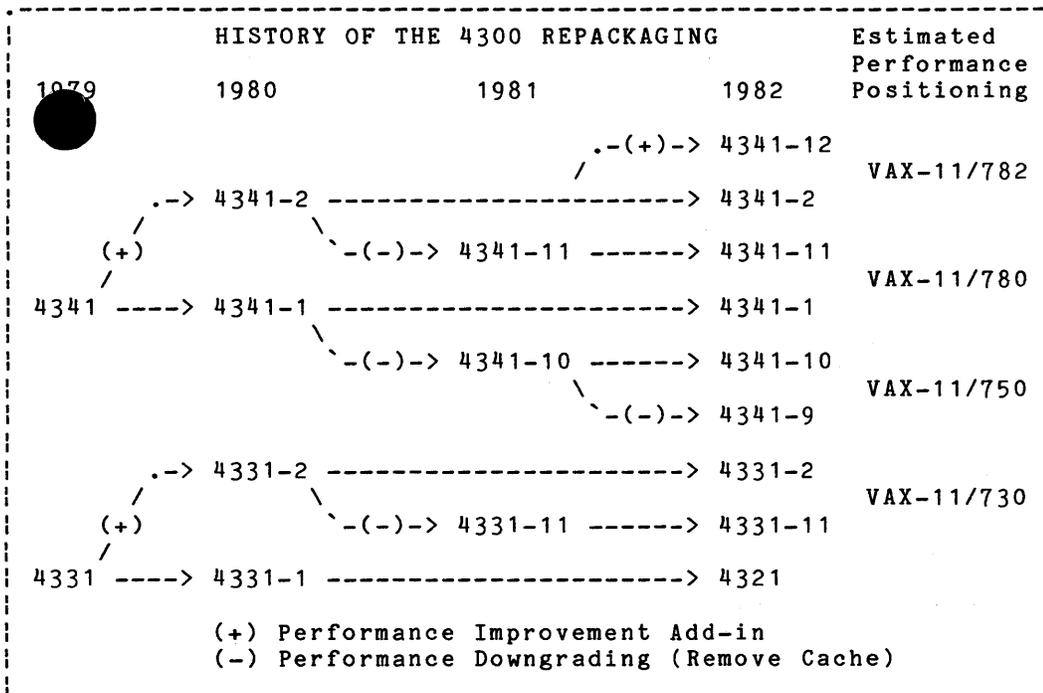IBM also announced two new models of the 4300 family:

- The 4341-9 -- positioned above the 4331-2 and below the 4341-10, placing the power of this machine a little below the VAX-11/750.

- The 4341-12 processor -- 15% more powerful than the 4341-2, placing this computer in the same compute performance range as the VAX-11/782.

4300 REPACKAGING OVERVIEW

In 1980, IBM introduced performance improvements to the two 4300 processors. In 1981, IBM downgraded the performance features to create three new models. IBM also renamed the 4331-1 because of that processor's performance reputation. In 1982 IBM has improved the performance of the high-end machine and downgraded the smallest 4341 to create two more models.

PERFORMANCE POSITIONING OF 4300 TO VAX

This is the new lineup of 4300 systems and VAX systems:

```
.---------------------------------------------------------------------.
|             HISTORY OF THE 4300 REPACKAGING      Estimated          |
|                                                  Performance        |
|  1979      1980            1981            1982   Positioning        |
|                                                                     |
|                                    .-(+)-> 4341-12                   |
|                                   /              VAX-11/782          |
|            .-> 4341-2 -----------------------> 4341-2               |
|           /          \                                              |
|         (+)           `-(-)-> 4341-11 ------> 4341-11               |
|         /                                        VAX-11/780          |
|  4341 ----> 4341-1 ---------------------------> 4341-1              |
|                   \                                                 |
|                    `-(-)-> 4341-10 ------> 4341-10                  |
|                                   \              VAX-11/750          |
|                                    `-(-)-> 4341-9                    |
|                                                                     |
|            .-> 4331-2 -----------------------> 4331-2               |
|           /          \                           VAX-11/730          |
|         (+)           `-(-)-> 4331-11 ------> 4331-11               |
|         /                                                           |
|  4331 ----> 4331-1 ---------------------------> 4321                |
|                                                                     |
|            (+) Performance Improvement Add-in                       |
|            (-) Performance Downgrading (Remove Cache)               |
|_____|
```

Notes: Technical benchmarks show the VAX-11/782 to be from 1.6 to 1.8 times the compute power of the VAX-11/780. This would position the 11/782 against the high end of the 4300 line. However, this is in compute power only, not in I/O performance. The interactive performance of any computer system will vary greatly depending on the job mix between compute and I/O requirements.

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The VAX to 4300 performance positioning is an estimate only and is slightly different from previous positioning. The VAX family has undergone some hardware (FP750, 64K bit memory, DMF32) and some software improvements (VAX/VMS Version 3.0) -- thus the increase in positioning upward against the 4300s.

There are two main models of the 4300 family -- the 4331 and the 4341 -- with various performance options.

COMPETITIVE PRICE POSITIONING

Numerous VAX and 4300 systems were configured using the new IBM pricing and new Digital packages (reference Sales Update Vol. 14 No. 8 dated October 11, 1982). The results show that Digital still holds a very substantial lead, ⬤ after the IBM price reduction. The following chart shows groups of systems number of user terminals. The processors are ranked by estimated processor perform- ance with the first listed system in each group being the most powerful. The VAX systems are very competitive, even when compared to IBM 4300 systems with less than one-half the power.

Competitive Price Position between VAX Systems and IBM 4300					
Users	System	Hardware Purchase	Monthly Maintenance	Five-Year Software Charges	Five-Year Cost of Ownership
48	VAX-11/782	$ 603,270	$3,926	$ 71,555	$459,868
48	4341-2	$1,024,782	$4,397	$338,844	$793,922
48	4341-11	$ 934,782	$4,281	$334,478	$738,234
32	4341-11	$ 730,916	$3,226	$334,478	$599,877
32	VAX-11/780	$ 376,620	$2,472	$ 71,555	$300,299
32	4341-1	$ 695,916	$3,092	$333,770	$577,227
24	4341-10	$ 581,095	$2,777	$330,643	$503,357
24	VAX-11/750	$ 183,655	$1,237	$ 70,700	$164,218
24	4341-9	$ 522,095	$2,673	$237,968	$435,216
24	4331-2	$ 412,576	$2,312	$211,754	$355,748
16	VAX-11/750	$ 178,585	$1,130	$ 70,700	$159,248
16	4341-9	$ 446,145	$2,330	$237,968	$384,661
16	4331-2	$ 294,051	$1,588	$211,754	$273,105
16	VAX-11/730	$ 127,115	$ 918	$ 67,850	$124,294
16	4331-11	$ 266,326	$1,673	$209,335	$257,446
8	VAX-11/730	$ 86,470	$ 612	$ 67,850	$ 94,827
8	4331-11 SSX	$ 184,536	$1,256	$ 36,992	$148,651
8	4321 SSX	$ 148,446	$1,001	$ 35,163	$122,525

SSX = Subset of DOS/VSE and much less function than VAX/VMS

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All other IBM systems configured with VM/DOS.

These systems were configured with the same amount of user disk space, tape, printer and processor memory. All systems priced using undiscounted list prices, basic field service support and highest levels of software support and license.

DIGITAL VERSUS IBM SYSTEM PRICE POSITIONING CHARTS

'IBM systems were compared to Digital systems using the same set of configuring rules and comparable pricing:

- No discounts, U.S. list
- Basic Field Service
- Fully supported software licenses and support

Digital operating system used is either CTS-300 (CTS), RSTS/E or VAX/VMS. For IBM, SSX is the low-level subset of DOS/VSE; MVS is the high-end operating system and all other 4300s use VM/DOS.

All Digital systems have RA80, R80 or RA81 disks unless noted. All IBM systems use either 3310 or 3370 disks.

PDP-11 systems are priced with customer supported level software and Basic Service. This pricing is most similar to System/34 and Series/1 pricing and service levels.

The high-end chart uses a scale of $25,000 per line while the low-end chart uses $5,000 per line. There is some overlap between the charts.

```
5-Year                Low-end Systems - Scale $5,000 per line
Cost of
Ownership        :        8        :            Terminals/Users
                 :-------------:
$324K:     4     :   4341-9    :      16             24              32
-----+-----------+-------------+-------------+-------------+---------
$225K:           :             :             :             :   S38-4
$220K:           :             :             :    8140     :
$215K:           :             :             :             :
$210K:           :             :             :             :
$205K:           :             :             :             :
$200K:           :             :             :             :
$195K:           :             :             :             :
$190K:           :   4331-11   :4331-11 SSX  :             :   11/750
$185K:           :             :             :             :
$180K:           :             :             :11/750 RA60  :
$175K:           :             :             :  S38-4      :
$170K:           :             :             :             :
$165K:           :             :    8140     :   11/750    :
$160K:           :             :S38-4 11/750 :    S/1      :
$155K:           :   4321 VM   :    S38-3    :             :
$150K:           :4331-11 SSX  :             :             :
$145K:  4321 VM  :             :             :11/730 RA60  :
$140K:           :             :             :             :
$135K:           :             :             :             :
$130K:           :             :             :             :
$125K:           :    8140     : 11/730 RA80 :             :
$120K:           :  4321 SSX   :             :             :
$115K:           :             :    S/1      :             :
$110K: 4321 SSX  :    8130     :             :             :
$105K:           :             :    S/34     :             :
$100K:           :    S38-3    :             :             :
$ 95K:           :   11/730    :             :             :
$ 90K:           :             :11/44 RSTS/E :             :
$ 85K:           :             :             :             :
$ 80K:8130 11/730:             :11/24 RSTS/E :             :
$ 75K:           :    S/1      :             :             :
$ 70K:           :11/44 RSTS/E :             :             :
$ 65K:           :    S/34     :             :             :
$ 60K:           :             :             :             :
$ 55K:           :11/24 RSTS/E :             :             :
$ 50K:    S/34   :             :             :             :
$ 45K:    S/1    :             :             :             :
$ 40K: 11/24 CTS :             :             :             :
$ 35K: 11/23 CTS :             :             :             :
$ 30K: MICRO/    :             :             :             :
     :  PDP-11   :             :             :             :
-----:-----------:-------------:-------------:-------------:---------
USERS:     4     :      8      :     16      :     24      :     32
-----'-----------'-------------'-------------'-------------'---------
```

VAX, IBM 4300, 8100, S/38: U.S. list price, Basic FS Service, Full
SWS Support. PDP-11, S/34, S/1: U.S. List, Basic Service, Customer
Supported Software.

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High-end Systems - Scale $25,000 per line

5-Year Cost of Ownership	16	24	32	48	64
>$1M				4341-2 MVS	4341-12 MVS / 4341-2 MVS
$900K					4341-12
$875K					4341-2
$850K					
$825K					
$800K				4341-2	
$775K					
$750K					
$725K				4341-11	
$700K					
$675K					
$650K					
$625K					
$600K			4341-11		
$575K			4341-1		11/782 RP07
$550K					
$525K		4341-1			
$500K		4341-10			
$475K					
$450K	4341-10			11/782 RP07	
$425K			11/782 RM05		
$400K					
$375K	4341-9				S38-7 11/780
$350K		4331-2			
$325K				S/38-7 11/780	
$300K					
$275K	4331-2		11/780	S/38-5	
$250K	4331-11		S/38-7		
$225K		8140	S/38-5	11/750	
$200K			11/750		
USERS	16	24	32	48	64

All Systems: U.S. list price, Basic FS Service, Full SWS Support.

IBM PERSONAL COMPUTER UPDATE

Ken Gontarz
X3821 MK02-2/D17
RCS: MK02

IBM recently announced several enhancements to its Personal Computer. They include the following:

HARDWARE

1. New Graphics Printer (FCS January 1983) priced at $595
2. Graphics conversion kit for existing printer (FCS January 1983)

Comments: The new graphics printer is an enhanced version of the existing IBM PC dot matrix printer from Epson, which it replaces. Features include print speed of 80 cps, bi-directional printing, bit-mapped graphics capabilities of 240 x 216 addressable dots per inch, two character sets (graphics and international), as well as the ability to superscript, subscript and underline.

Digital's LA50 offers all the functionality of the IBM printer and significantly more:

● A choice of operating speeds for the desired letter quality -- 50 or 100 cps

● An adjustable width tractor

● 8-bit code handling to meet ISO standards

● A print head with a life expectancy twice that of IBM's

While the IBM printer gives more resolution, most of today's personal computer graphics applications cannot make use of it. Important to note is that images appearing on a CRT can be reproduced with about the same resolution by both Digital's LA50 and IBM's new printer. The LA50 costs $695.

SOFTWARE

● Multiplan   – Spread sheet simulator by Microsoft for $250
● pfs:FILE   – Information management program for $140
● pfs:REPORT   – Report generator for $125
● A Full-Screen Editor – used for memo and program creation ($100)
● Basic Language Program Development Tool Kit for $130
● IBM Personal Computer Casino Games $35

Comments: Similar, if not the same software, is available on Digital's RAINBOW and Professional 325/350 systems. For example, Multiplan from Microsoft is available on Digital systems as is, a full-screen editor. The point is that there exists a tremendous amount of application software for both Digital and IBM Personal Computers.

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SERVICES OFFERED THROUGH AUTHORIZED DEALERS

- Nine-month contract for initial purchased systems
- Twelve-month contract for after first year systems
- Separately priced contracts for the System Unit, IBM printers and IBM Monochrome Display
- Nine-month warranty extension option for carry-in service

Note: Reference the accompanying article entitled "IBM Personal Computer - Maintenance Policies/Prices."

FUTURES

Several new major announcements can be expected for the IBM PC in the next year:

- A 10MB Winchester drive (Seagate, Shugart, Miniscribe) by April or May

- Replacement of the current Intel 8088 CPU with the faster, less expensive and fully compatible Intel 80188 CPU

- Communications/Networking Enhancements

IBM PERSONAL COMPUTER - MAINTENANCE POLICIES/PRICES

Ken Gontarz
X3821 MK02-2/D17
RCS: MK02

This article provides the latest information on IBM's Field Service policies
and prices. Currently there are three service agreements offered for the IBM
Personal Computer. They include:

- Pick-up and Delivery
- Carry-In
- Mail-In

Currently, IBM does not offer any on-site remedial service. With a Pick-Up
and Delivery contract, an IBM representative will go to the customer site,
pick up the faulty system and return it WITHIN 48 HOURS. No stand-by or
replacement system will be provided within that 48 hour period (i.e., the
customer will be without the services of their computer during the time
required to repair the system).

With a Carry-In Service contract, a customer can bring faulty system
components to an IBM Service/Support Center and have them repaired WITHIN 48
HOURS of being received. In addition, if the faulty component happens to be
the KEYBOARD, the CRT or the PRINTER, they can arrange to use a replacement
(at no charge) for that two-day period. If the faulty component is the system
unit (which contains the CPU and floppy diskette drives), no replacement
system will be provided.

Finally, the last service offered for the IBM PC is a Mail-In contract. The
customer agrees to prepay shipping charges and accepts the risk of loss and/or
damage in transit. IBM will pay non-premium shipping charges and will assume
risk of loss and/or damage for the return shipment. Mail-In Service for
faulty components will be handled out of one location only -- Oak Brook,
Illinois, site of the IBM Personal Computer Support Center.

Comment: Support agreements offered by Digital for its family of Personal
          Computers provide the customer with benefits not offered by IBM.
          Like IBM, Digital provides both Carry-In and Mail-In Service
          Contracts. Only Digital offers On-Site Remedial contracts as well.
          With the purchase of either an On-Site or a Carry-In Service
          Contract there are several important benefits Digital provides that
          IBM does not:

- Free ECO changes (engineering change orders)

- An 800 number hot-line for both software and hardware inquiries

- A monthly newsletter keeping the customer up-to-date on any
  important developments on their system

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IBM PRICING

Component	Pick-Up/Delivery Service	Carry-In Service	Mail-In Service
System Unit (CPU, 64KB, keyboard)	$139/yr.	$111/yr.	$97.50/yr.
320KB Floppy	$73.50/yr.	$59/yr.	$51.50/yr.
CRT (Monochrome)	$50/yr.	$40/yr.	$35/yr.
80 cps Printer (Epson)	$85/yr.	$68/yr.	$59.50/yr.
Memory expansion option card (to 256KB)	$50/yr.	$40/yr.	$35/yr.
64KB memory board*	No Charge	No Charge	No Charge

*If you buy the memory expansion option card allowing up to 256KB of memory per card, the actual 64KB increment boards have no maintenance charge associated with them.

PER CALL RATE (Time and Material): $96/hr. with .7 hours minimum charge

Currently IBM does not offer a hard disk for its PC. However, by late spring or early summer a 10MB Winchester is expected to be announced.