DATA SYSTEMS NEWSLETTER

Vol. 3, No. 11
April 15, 1976

For HP Field Sales Personnel

4K RAM TECHNOLOGY PAYS OFF

- 16K Words Memory for $2100
- $1365 in OEM Qty 100
- Reliability in Excess of Core
- 256K Words in 2112 + Extender
- Delivery 8 Weeks ARO

In This Issue...

SPECIAL EDITION

DSD NEWSLETTER

HP ANNOUNCES 16K WORDS FOR $2100

By: Bill Senske

Announcing the *HP 13187A 16K memory module* for the 21MX computer. This new product using latest state of the art *MOS* memory is *$2100 list** and is orderable today. The product availability is *8 weeks ARO.*

The new product has 3 key features:

- Price = more sales
- Reliability = more happy customers
- Packaging = larger memory configuration at lower prices.

With this new low price we are expecting the average system sale to go from 24K/CPU to 32K per CPU. This means a better system and better value for your customer. We also are anticipating a 10 - 15% increase in CPU sales because of the value sensitivity of the Minicomputer market.

The $2100 price is significantly below two 8K module price of $3000. The 8K module price is not being changed.

21MX M-Series configurations (M/10, M/20, M/30) are from 12 to 30% less costly when bought with the 13187A 16K memories. For example, a 2105 was $4150 + $600 (after May 1) for controller + $3000 for 2-8K modules, for a total of $7750. The total is now $6850 or 12% below last month's approach.

At the other extreme look at a 2112 ($6200) with controller ($600), Dynamic mapping ($1950), and 128K of 16K memory modules ($16,800). The total is now $25,550 and as you know it was $36,250 when you went to 2102-008 memories ($24,000) and a 12990 memory extender ($3500). That is an effective 30% price reduction for the 128K user.

These price benefits have come through experience with the 4K RAM parts. We have explained some of the problems of the past to you, but the solutions have brought us savings. For instance, in the manufacturing test cycle we have learned to identify many of the parts that are likely to fail not only in the process, but also in the early life of the customers product. This is an obvious cash savings to HP. Our experience in handling the 4K parts has taught us how to pre-stress the parts to weed out many that would otherwise fail during the manufacturing process. This saves technician time which saves money.

Another major area of savings is our purchase price. Most vendors acknowledge that HP is the largest (and most knowledgeable) user of 4K RAM memories. Our large volume plus our testing ability have given us the ability to negotiate favorable terms with Texas Instruments for their 4K RAM parts.

In accordance with our normal pricing practices, all of these savings have been passed along in the form of a low purchase price; as low as $1365 in quantities. This new product has resulted in your customer being able to now buy 16K of 4K RAM memory for 30% less than he previously could.

And this price also makes you the price leader among the major mini manufacturers, HP, DEC and DG. Your price is 32% below DEC's $3100 add-on price for the 11/34 and 43% below the Nova 3's $3700 add-on price.

Dave Carver has written an article on our competitive position with the 16K Board and *LeRoy Nelson* has written an article about trade-in and how to order.

Reliability improvements have also been a source of savings. We don't have to review history but you know the 21MX's are reliable today. Many of you have told me in recent phone calls that your customers are extremely pleased with the 21MX performance.

Ray Zuck, Operations VP of Geometric Data, tells me that since October his company has never had a 21MX fail on a customers site. He ships about 8 per month. That isn't all luck. Our warranty reports also display a significant reduction in 4K RAM failures during the September to March period. The new 18 pin parts look even better in early tests. With this newsletter you will find articles by myself and *Dave* discussing how the Reliability tests have proceeded using the 21MX's new 16K memory module.

Reliability also pays off for the customer. Lower service prices and more uptime result in greater customer satisfaction. *Carver's* competitive letter will be an eye opener for you if you think that a *73%* difference in memory service prices matters to your systems customer.

Besides pricing and reliability, packaging is another key feature of the 16K board. (The competitive letter will detail better for you the advantage of the 16K board.) Sure, not having to buy an extender may win a quote, but not having to get another cabinet may be more important. Or perhaps fitting the computer into a small corner is the key. Now a 32K M/10 can solve many problems that just couldn't be handled any other way before. Another less obvious advantage is the appearance of the smaller box. Many 64K customers would prefer to use the M/20.

By now you must be convinced that the 13187A is what you want to sell. When can we ship? We are shipping in volume today. Since there is a backlog created by last year's X1 sales (what were they?) we have a current availability of 8 weeks ARO. Change orders for the purpose of switching to the 16K memory boards will be rescheduled per the current availability schedule as if they were new orders, so if delivery is a key issue with your customer *DO NOT, DO NOT* retransmit orders or changes to orders to get the new HP 13187A 16K memory module.

Summary:

Product:	13187A (et al.)
Price:	$2100 (list)
Avail.:	8 weeks ARO

FEATURES	**BENEFITS**
Price	more customers
Reliability	happy customers
Packaging	lower total quotes

*$2100 list USA subject to change w/o notice.

21MX SEMICONDUCTOR MEMORY RELIABILITY

By: Dave Carver

The design of the Hewlett-Packard 21MX computer is optimized for the use of 4K MOS/RAM semiconductor memory components. Besides the cost and speed advantages of the 4K RAM integrated circuit, RADC II calculations indicated that significant improvements in Mean Time Between Failure (MTBF) performance over core memory computers could be realized by using 4K RAM memory components. Actual performance data, gathered both from in-house reliability tests and failure information reported from field installations, has demonstrated that these improvements have been realized.

To describe reliability measures for the 21MX and its memory system, some definitions must be given.

Failure Rate is the percentage of failures per unit of time. In this report, all failure rates given are *averages*. These figures are usually given in percent per thousand hours, meaning that, on average, a device has a certain percentage chance of failing if it is operated for a thousand hours. Since a failure of any semiconductor device will usually cause a failure in the equipment, the equipment failure rate is taken to be the sum of the failure rates of the devices that make up the equipment.

Mean Time Between Failure (MTBF) is the *average* operating time between failures, and is reciprocal of the failure rate. Since failure rates used here are average numbers, MTBF figures shown are averages, and should not be taken as the time between failures on a particular piece of equipment. Semiconductor devices exhibit a changing failure rate with time; therefore MTBF figures are meaningless unless associated with the time frame over which they are taken.

Calculated MTBF is an estimate of the average MTBF of a device over its *entire life*. Calculated MTBF is derived according to procedures developed by the Rome Air Development Center (the procedure is referred to as RADC II). Calculated MTBF figures assume that the device exhibits a constant failure rate over time.

Objective. The objective of the reliability studies conducted by Hewlett-Packard is to determine the average number of device failures that can be expected between any two points in time.

Method. For purposes of reliability measurement, extensive tests have been conducted using 21MX minicomputers and memory systems that had completed the normal production process and were ready for shipment to customers. The equipment was operated continuously over a period of fourteen weeks with diagnostic software. The diagnostics exercised many of the computer and memory functions continuously and comprehensive diagnostics were used every 168 hours to check all functions. The test was conducted at the HP Data Systems manufacturing facility, in the production area. The electrical environment appeared to be stable, the temperature averaged 25°C, and the equipment was stationary.

Test data from the 1974 test shows the accumulation of over 52,000 test hours on computer mainframes (exclusive of memory). The 1976 test involves over 43,000 test hours on the HP 13187A 16K memory module, and over 2,900,000 test hours involving over 2,600 4K RAM IC's. The raw test data has been processed according to the procedure described below to yield a projection of reliability performance over the life of the products.

There are typically two regions in the life of a semiconductor (see figure 1). The first region is called the infant mortality region and is characterized by a failure probability that declines with time. After several hours of operation, the probability of failure diminishes greatly, and the rate of change in failure probability over time becomes much less. This region is called the random failure region because the probability of failure, though still diminishing, is almost independent of time.

FIGURE 1

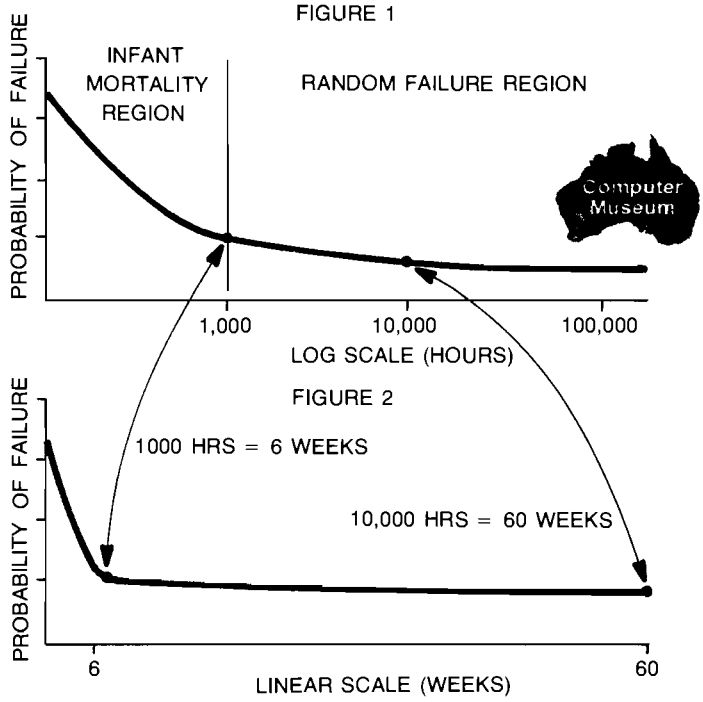

FIGURE 2

Figure 2 represents the same curve on a linear scale. Note the insignificance of the infant mortality region.

Reliability studies have shown that the semiconductor failure model is described by a log-normal probability density function. Using this result, test data can be gathered over a comparatively short period of time and be used to generate a failure model which describes the failure characteristics over the entire life of the equipment. A method of generating these models, due to Nelson[1] and called hazard plotting, has been used to generate the results of this report. The curves generated are called hazard rate plots to denote that any point on the curve is the expected instantaneous failure rate of the device at that point in time. The integral of the hazard rate between any two points in time gives the expected number of failures in that period of time. The result of the integration may be interpreted as the average MTBF of a device over that period of time.

Results. The numbers presented in the following table are derived from the hazard rate curves generated from the relia-

1. Nelson, W., "Hazard Plotting for Incomplete Failure Data," Journal of Quality Technology, VI, Nr. 1, Jan., 1969, pp 27-52.

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bility tests. The figures apply to the 21MX computer with 13187A memory modules. They represent the integrated value over the period of time from shipment to the first 500 hours, 1000 hours, etc. The key point of the chart is how dramatically the average MTBF improves as the equipment gains operating hours. Note that the first 500 hours is very insignificant compared to the total usage of the CPU.

The calculated MTBF figures are shown for comparison; the 21MX and memory cross over the calculated MTBF value between 1200 and 1500 operating hours after shipment.

Conclusion. Achieving the reliability promised by semiconductor memory systems is a complex task. The 4K RAM requires an extensive amount of testing for pattern sensitivity, leakage, and other defects which account for the higher failure rate in the infant mortality region of its life. HP has, over the last two years, gained a large amount of experience which has enabled the development of proprietary manufacturing procedures and microprogrammed diagnostics which in turn make possible the impressive MTBF statistics quoted above. These procedures have resulted in a 38% increase in the number of early failures discovered before shipment, and Data Systems reliability experts are constantly evaluating methods for further improvements. The end result of these efforts is reliability performance second to none.

EQUIVALENT INTEGRATED FAILURES vs TIME EXPRESSED AS AVERAGE MTBF (HOURS)

MEMORY SIZE	INITIAL MTBF WHEN AVERAGED OVER THE:			MTBF EXCLUDING 1ST 500 HOURS		CALCULATED*
	1st 500 Hrs	1st 1000 Hrs	1st 5000 Hrs	Next 1000 Hrs	Next 5000 Hrs	Per RADC II
16K	2553	3067	5212	4216	6073	4301
32K	1953	2391	4295	3420	5121	3570
64K	1336	1670	3187	2500	3906	2549

*Calculated Value is based on RADC II Methods: Ground Fixed Environment; 40°C Component Temperature; 50% Average Stress Level; and Upper Grade Component Quality.

NOTE: The above information is based on the results of the previously described HP Reliability Tests and is for general guidance purposes only. It shall not be interpreted as warranted specification for any of the products involved.

SPACE PROBLEMS?

By: Stu Kagan

Do you have an OEM that's concerned about the racking space required using our CPU's? Well, worry no more; we now have the answer to their problems — 16K memory boards!!!

E-Systems — *Jack Oliphant's* account down Texas way, uses the 21MX series in systems destined for airborne applications. As always, the available space on the aircraft is minimal and every effort is made to keep weight down to the lowest possible level. And, I might add, that the customer's memory requirements have increased drastically over the past year so that the 2105 and 2108 could no longer hold enough memory to do the job. Things were further compounded by the limits imposed on E-Systems by their customer making rack space for a 2112A unavailable. *Jack* was able to offer a temporary solution with the discovery that (5) five memory boards could work in a 2108A, providing that the power supply was not overloaded.

But, as good memory gobblers go, E-Systems quickly grew to need much more working memory than our processors were able to support.

That was yesterday! Today E-Systems can support 32K in the 2105 and 80K in the 2108. Their rack space/memory size problem is solved and *Jack* can get back to work at becoming a rich HP salesman.

Remember — the customer can now handle more memory in a smaller and thereby less expensive box. On top of that, the price of 16K boards is drastically below our price for the 8K's. WE'RE LESS EXPENSIVE!

We have the lead! Let's run with it and SELL OEM!

Dave Carver, LeRoy Nelson, and Bill Senske just want to say THANKS in advance for selling this new product for us.

EVERYTHING YOU NEED TO KNOW, BUT WERE AFRAID TO ASK ABOUT ORDERING 16K MEMORY MODULES

By: LeRoy Nelson

The product number for the 16K word semiconductor Memory Module is 13187A. The 16K word module is compatible with the 2102A Memory Controller and can be added to current systems. Remember, the 12976A Dynamic Mapping System is required for all systems with more than 32K of memory.

Ordering procedure:

1. For additions to systems or new orders use 13187A.
2. On new orders for processors or systems use

   2102A
   2102A-016

3. When ordering with discomputers use

   2124B-016 - Replaces the 8K module that is standard in the discomputer with one 16K module.

   2124B-216 - Adds a 16K module to a discomputer order.

   2125A-016 - Replaces the 8K module that is standard in the discomputer with one 16K module.

   2125A-216 - Adds a 16K module to a discomputer order.

   9600A-P12 - Adds a 16K module to a 9600 system.

Prices

The 16K memory module prices will appear on the 1 June Corporate Price List but will be orderable after the April 12th introduction via a Heart override.

13187A	$2100
2102A	600
-016	2100
2124B-016	600
-216	2100
2125A-016	600
-216	2100
9600A-P12	2100

SEMICONDUCTOR TECHNOLOGY TODAY

By: Bob Frankenberg

HP's leadership in semiconductor memory systems is an accomplished fact, a fact that gives us tremendous competitive advantages. Not only have we shipped more 4K N-channel RAMs by a considerable margin than anyone else in the computer business (thanks to you!) but we've also led the way in increasing part and system reliability, refining and enhancing testing techniques and, indeed, set the standard by which all semiconductor memory parts and systems are judged. Steady improvements in our proprietary test techniques have enabled us to do an excellent system testing job. Our proprietary production stressing and burn-in systems have allowed us to deliver memory systems with dramatically increasing reliability. This leadership position has not only benefitted the 21MX Computer Series, but also HP terminals, calculators, TV interface, and many other products.

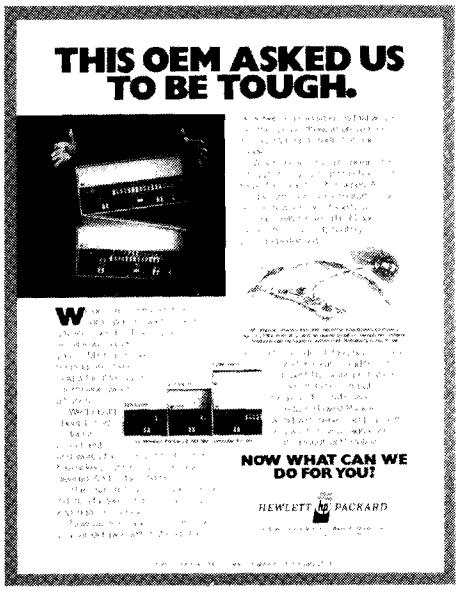
Our commitment to cost reduced semiconductor memory systems coupled with that industry's incredible cost/price reductions has made possible the introduction of the 13187A, the lowest priced 16K memory module offered by the major minicomputer suppliers. These low memory prices coupled with DMS and RTE-III enhance what was already an unbeatable combination.

Our 4 years of experience with 4K RAM semiconductor memory systems in all areas — price, reliability, density, and performance has borne out the initial projections made for these systems. We've had some problems along the way, but by addressing these problems, solving them, and pursuing better, more effective ways to stress parts, test them, and build systems we've learned how to produce truly excellent systems. Others still have to learn these lessons to be effective in our market.

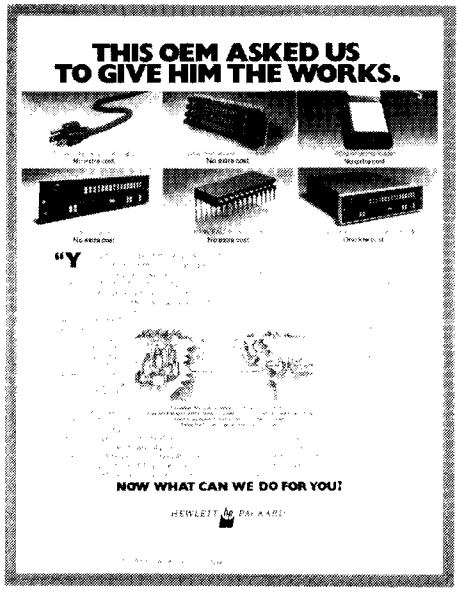
I'm sure you're curious about the factors that have made these advances possible. I'll try to briefly describe the why's behind how we got to where we are. First on the list is extremely capable people. The design team (*Jan Hofland* and *Gordon Goodrich*), a very capable production team (led by *John Weidert* and *John Mathews*) and the QA and reliability efforts put forth by *Don Hjille, Bill Thormahlen,* and *Jim Gillette* produced an excellent system design which can be used to upgrade existing 21MX systems without change. Their interaction with our vendors facilitated changes in part and test design to help create the right part for the job and then tested that part to our stringent reliability requirements.

Our part vendors have also recognized the value of reliability in 4K RAMs and have instituted significant stressing, failure analysis, and design and/or process changes to improve reliability and testing effectiveness. We've seen the results of their efforts in both incoming inspection of production parts and in evaluation lots on parts not used in production. We anticipate that these efforts will produce even more reliable parts than the impressive record achieved in the parts used in the 13187A. One further point on our efforts in this area. If you haven't seen the 4K RAM burn in and test area in the factory it's a "must see" on your next trip to the factory. A really capable group of people are doing a fine job. One thing you won't see is the cooperative effort we've instituted with our vendors to assure increased part reliability, but you can take comfort in knowing it's there.

So we now have a well tested 16K memory module, with increased system reliability, increased density, and dramatically decreased prices. It's been a while getting here, but we know you wanted a good product when you got it. We thank you all for your patience. The end result is that all of those vectors are pointed in the right direction and with significant magnitudes to help you continue your super success story selling 21MX.



The HP 21MX is Tough. Ask MAGNAVOX.



The HP 21MX is the Works. Ask CANADIAN MARCONI.

The HP 21MX is a Head Start. Ask MSTI.

THESE OEM SUPPLIERS KNOW THEY CAN'T FIGHT FACTS!

NAME	16K PARITY MEMORY ADD-ON	64K COMPUTER*
HP 21MX	$1386	$10,725
DEC 11/34	$2046	$12,665
NOVA 3/12	$2368	$14,528

SOURCE: DATAPRO
OEM QTY 50

*INCLUDES CPU, PARITY MEMORY, MEMORY MANAGEMENT, AND EAU.

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This Advertisement will first appear in the Data Systems Newsletter, April 1976.

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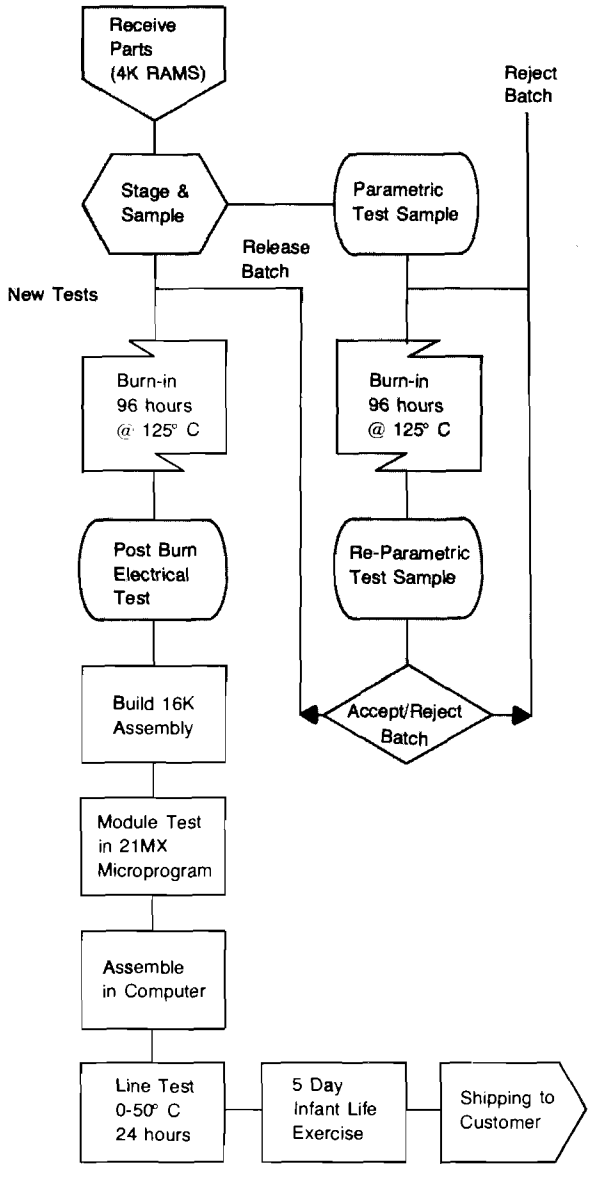
The HP 21MX is TOUGH TO BEAT. Ask DEC or Data General!

MANUFACTURING TEAM PROFITS FROM MEMORY EXPERIENCE

By: Bill Senske

Warranty calls are dropping steadily, manufacturing costs are lower, customers are happy and prices drop again. These all reflect some significant advances in the 4K MOS/RAM manufacturing process. You all recognize the test cycle that we have shown you before. There are some new processes (shaded area) that mean better profits for HP & better products for our customers.



A detailed discussion of the new tests will help explain to your new customer why HP is the only place to buy Semi Conductor Memory based minicomputer systems.

Early warranty experience highlighted areas for improvement. Improving the electrical environment on the board solved some problems, but a major attack on chip reliability was the real key. It was noted that different vendor batches were of different quality, and we had no way to find subtle differences between batches. A component level test for electrical parameters before and after burn-in was started. This began to really identify the culprits. Certain parameters changed rapidly in the burn-in process if it was a bad batch. We found defective groups tended to continue to fail. Even if we sorted out the good ones they eventually turned bad, sometimes on a customer's site. Now we know to send them back.

We have also upgraded the diagnostic and created a production level test for pattern sensitivity. This test is a 21MX microprogram that exercises memory at an exceedingly high speed.

All of these efforts have paid off. The 21MX memory failure rate in our production "run-in process" is 300% less than it was prior to the implementation of these tests. The heroes are *Frankenberg's* design team, along with a hearty thanks for *John Matthews* and *John Weidert*, the manufacturing team leaders.

NEW MEMORY HELPS 21MX REMAIN VALUE LEADER

By: David Carver

The new 16K module brings lower prices and greater packaging density to the 21MX line, along with the excellent reliability we've learned to build into our products over the last two years. With this new product, the 21MX series is in a very strong position compared to its mainstream competition.

Let's first take a look at add-on parity memory prices. HP is the leader by 32% which makes large memory systems even more attractive. Also listed are memory maintenance prices. Use these to convince your prospect that our reliability is for real!

16K ADD-ON MEMORY

MODEL	LIST PRICE	MONTHLY MAINT.
HP 16K MOS WITH PARITY	2100	10
DEC 16K MOS WITH PARITY	3100	36
DG 16K MOS WITH PARITY	3700	38

To see what the new memory module does for our competitive price position, take a look at the following table. It compares new 21MX prices against the most current competitive models. Note that not all the the computers are expandable beyond 32K.

21MX – THE ONLY LOW COST SOLUTION FOR LARGE MEMORY SYSTEMS

	16K		32K		64K		128K		256K	
MODEL	**PRICE**	**% Δ**	**PRICE**	**% Δ**	**PRICE**	**% Δ**	**PRICE**	**% Δ**	**PRICE**	**% Δ**
TI 990/10	5,575	−24	7,700	−18	11,950	−29	20,450	−22		
21-M/10**	**7,325**	—	**9,425**	—						
DEC 11/04**	7,500	+2	10,500	+11						
Honeywell 6/36**	7,900	+8	11,100	+18	17,500	+5				
DEC 11/34 (5")	9,290	+27	11,790	+25						
21-M/20	**10,425**	**+42**	**12,525**	**+33**	**16,725**	—	**29,225**	**+12**		
DEC 11/34 (10")	11,190	+53	13,690	+45	19,890	+19	32,290	+24		
21-M/30	**11,450**	**+56**	**13,550**	**+44**	**17,750**	**+6**	**26,150**	—	**47,050**	—
DG NOVA 3/12	11,800	+62	15,800	+68	23,200	+39	38,000	+45		
GA 16/440	11,800	+62	15,150	+61	21,850	+31				
DG Eclipse S/100**	11,900	+63	17,300	+84						
Interdata 7/32	15,450	+111	20,450	+117	30,450	+82	50,450	+93		
DG Eclipse S/200*	16,300	+123	21,700	+130	32,500	+94	57,100	+118		
DEC 11/45			34,000	+260	45,000	+170	63,000	+141		
Interdata 8/32							64,000	+145	88,000	+87
DEC 11/70							66,000	+152	94,400	+100

*Prices include CPU, Parity Memory, Powerfail Recovery, EAU, Memory Management and Protect.

**Memory Management not available.

The table clearly shows that the 21MX is the value leader throughout the spectrum. We have engineered in as standard, key features such as EAU, floating point, and parity because they are *required* for systems applications. A fundamental design philosophy of the 21MX is to build in growth paths that are easy and inexpensive, so that your OEM can expand his product line without incurring big development costs. For example, our new 16K module makes memory expansion the cheapest in the industry. Upgrading mainframes from M/10 to M/20 to M/30 is a snap, because the instruction sets are identical, the software is the same and the spare parts are the same. Expanding instruction sets is inexpensive with such options as FFP and DMS. The OEM who wants to tailor his instruction set to his own needs only has one choice because HP microprogramming offers more flexibility and support than anyone. Even our I/O interfaces are inexpensive because they're easily designed.

For those OEMs who need even more power and expandability, we have the highest performing cartridge disc subsystem in the business. The MX/65 DISComputer provides a low entry cost, high performance, and a smart controller to make the powerful combination play together. If your customer needs still *more* power, the cost of the 21MX or MX/65 is so low that he can afford to buy *two* of them for about the same money as an Eclipse or 11/45 system, and have more capability. And don't forget that we have excellent Distributed Systems software to make all this power usable. Now that's value!

Let's take a closer look at the two key competitors for the 21MX, the NOVA 3 and the 11/34.

NOVA 3

DG's latest NOVA has many striking similarities to the 21MX (see the Data Systems Newletter of 11/7/75). Although DG advertises a low end price of $2600, the NOVA 3 has expensive options which bring its price near or over the 21MX when equivalent capabilities are included. For example, the NOVA 3 memory management unit is almost an exact duplicate of our DMS, except that it has no memory protect capability, and DG has finally offered parity memory. The NOVA architecture is similar to that of the 21MX; DG's instruction set can do stack operations and register-to-register arithmetic, but we can counter with microprogramming and a superior DMS. Other strengths of the NOVA 3 are its speed, hardware floating point, and use of semiconductor memory. DG probably has a lot to learn yet about producing memory, and has no disc drive comparable to our 7905. Sell our 4K RAM experience and attractive price!

DEC 11/34

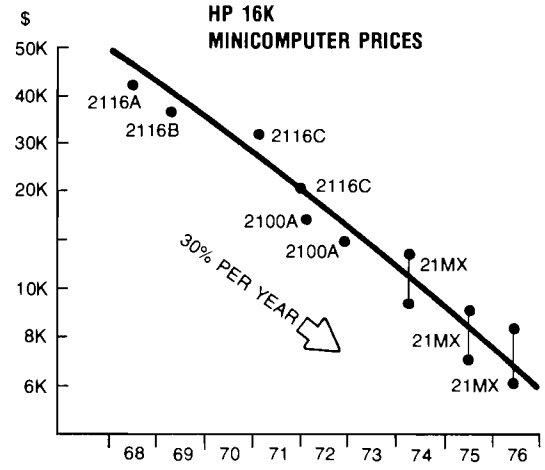
DEC's newest CPU is a revised version of their 11/35. They have packaged the CPU, memory management, and EAU all onto 2 boards (it previously required nine) through the use of more MSI and LSI components. This repackaging has resulted in a 30% price reduction, but cost dearly in terms of performance. Preliminary figures indicate that the 11/34 is 20-40% *slower* than the 11/35! The 21MX should do well in benchmarks against this machine, even if floating point is required (11/34 floating point costs $1400 extra, and is only slightly faster than 21MX floating point). The 11/34 uses either core or semiconductor memory. Strengths of the 11/34 include a flexible instruction set, low cost, compact packaging, and expandability. Their complex instruction set can be a mixed blessing in that some users don't want to learn the entire set, and thus end up using a subset. We can counter with user microprogramming, better performance, 4K RAM experience, and competitive price.

In summary, the 21MX is in a very strong position against the key competition, even those machines introduced less than six months ago. Use HP's leadership in 4K RAM technology to sell those OEM's!

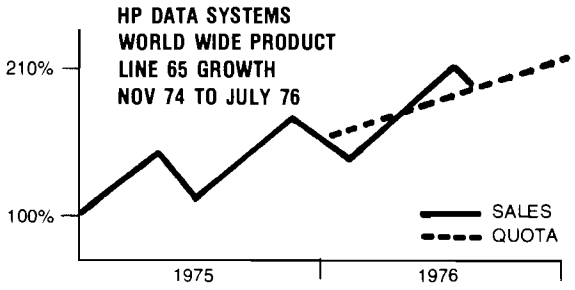
HP MINIS CONTINUE OEM PRICE LEADERSHIP AND MAINTAIN 8 YEAR PATTERN FOR SUCCESS

By: Bill Senske

Data Systems has always maintained a philosophy of keeping your OEM's as competitive as possible through price/performance leadership. We have always thrown in the "low cost" but high value extras and at the same time passed on pricing breaks as we got them. During 1974 and 1975 the 21MX established a clear price leadership in the mid-mini market. We have been flattered that the competition followed us so closely (see competitive article), but they must have known we would do it again.



The price leadership pays off in sales.



LARGE VOLUME GIVES PRICE LEADERSHIP

By: Bill Senske

One of the reasons that it has been possible to price the 21MX memory so attractively is our position of leadership in semiconductor memory systems.

Hewlett-Packard is known throughout the semiconductor industry as "the expert" on the design, testing, and production of 4K RAM memory systems. Because of our extensive experience we have been approached by several vendors requesting assistance and information about testing 4K RAMS.

People are continuing to look to HP for technical advice on the product, and many people feel that as HP goes, so goes the industry (vis-a-vis the 18 pin - 22 pin controversy).

The above fact plus our high volume usage has made us a target account for the semiconductor industry. Every major vendor has been knocking at our door. However, to date only TI memories have passed our stringent qualification tests.

But good things are happening with many of our potential vendors. NEC's parts are of a very high quality. Advanced micro devices and RCA are close with good 18 pin parts. Two vendors have even been using 21MX's for test parts. One bought over $20,000 worth of socketed boards for testing their product.

But HP chose TI, one of the few that could produce our 100,000 + piece monthly volume, and certainly one with lots of testing experience with the part. HP's system designers have found the TI part to be a nice combination of speed, low power consumption, and ease of system implementation. They have also been able to work closely with us to incorporate design improvements in their product.

The controversy of 4K RAM configurations is over, though HP has chosen the 18 pin version. Many other major users should fall in line when this becomes public. Further, by focusing our contract on the 18 pin part we really got maximum price leverage in the contract. That is why the 8K module is not being reduced. We put all our leverage on the higher value system.

All this adds up to HP's 18 pin memory being offered at a very attractive price schedule. Component prices are low enough to be profitable at the $2100 price and commitments for future prices that should give us room to continue value leadership.

Your Systems OEM's will find that buying large memory systems from HP will really pay off.

X2/X1 EXCHANGE PROGRAM

By: Joe Schoendorf

With the introduction of the 13187A 16K word memory module, we are prepared to honor our original commitment of exchange of 8K memory modules for 16K word memories to the very limited group of very early 21MX customers to whom we made a special commitment.

During the month of February, 1975, we compiled a list supplied by the Field Engineers of the customers who had ordered X1 - 16K memory but accepted X2-8K modules instead. Only the customers on this list are eligible for this exchange offer. We will honor this commitment until June 15, 1976. This list of customers so eligible is at the end of this article.

If these customers still wish to make this exchange, we are prepared to swap a 16K memory module in return for 2 each 8K modules to each of these listed customers for the price of $300, the original differential in effect a year ago.

Those customers with X1 (2101A) memory systems still on order will be shipped the new high density board. You will need to enter a change order to preserve your delivery position. Be sure to note original order transmittal date in special instructions.

	HP P.O. #	CUSTOMER
1.	2600-01190	DEMO
2.	9064-31805	Macquarrie Univ.
3.	9064-32257	McDonald Wagner & Priddle
4.	9064-32194	Mt. ISA Mines
5.	9066-32665	National Mapping
6.	9061-3216-	Alfred Hospital
7.	9064-31319	W. A. Univ.
8.	9064-32263	W. A. Univ.
9.	2414-45769	Fairchild (OEM)
10.	2414-45770	Fairchild (OEM)
11.	2414-45800	
12.	2414-46131	Lawrence Rad. Lab.
13.	2414-45801	Applied Tech. (OEM)
14.	31-11-50076	Westinghouse (OEM)
15.	3188-20032	ARL Texas (OEM)
16.	-9535	SERPRO 22-354 (OEM)
17.	-12857	SERPRO 22-354 (OEM)
18.	-12858	SERPRO 22-354 (OEM)
19.	-12859	SERPRO 22-354 (OEM)
20.	-12860	SERPRO 22-354 (OEM)
21.	-12861	SEPRO 22-354 (OEM)
22.	-12862	SERPRO 22-354 (OEM)
23.	1800-61663	Sci-Tex (OEM)
24.	1800-61662	Sci-Tex (OEM)
25.	1800-64393	Mod Israel
26.	-64662	Mod Israel
27.	3185-50125	Camsco (OEM)
28.	3185-50121	Camsco (OEM)
29.	3185-20207	E-Systems (OEM)
30.	3185-12706	E-Systems (OEM)
31.	3185-20179	E-Systems (OEM)
32.	2407-07382	Holloman AFB
33.	2407-07165	Holloman AFB
34.	78000-3615	Telecommunication Lab.
35.	2604-08273	Battelle Mem. Inst.
36.	3177-20121	Metric Systems (OEM)
37.	7910-19729	AEC (ICON)
38.	4430-58061	Realtronics (OEM)
39.	-66465	Realtronics (OEM)
40.	-66920	Realtronics (OEM)
41.	-66922	Realtronics (OEM)
42.	4430-60260	Telecheck (OEM)
43.	-64749	Telecheck (OEM)
44.	8701-90780	Sauber & Gisin (OEM)
45.	2417-19540	UCLA (VEU)

	HP P.O. #	CUSTOMER
46.	2417-20415	UCLA (VEU)
47.	-18853	UCLA (VEU)
48.	-51109	UCLA (VEU)
49.	4430-66796	American Univ.
50.	2417-19478	Magnavox (OEM)
51.	-19487	Magnavox (OEM)
52.	-20585	Magnavox (OEM)
53.	4415-22062	Weco (Combo)
54.	-29204	Weco (Combo)
55.	-22075	Weco (Combo)
56.	4415-24119	BTL
57.	-23760	BTL
58.	-70378	BTL
59.	4411-59705	Grumman
60.	-60503	Grumman
61.	2413-11065	Applied Theory Assoc.
62.	2413-11066	Applied Theory Assoc.
63.		Lockheed
64.	8903-02610	Aichi Eng. Univ.
65.	2414-37825	ESL (OEM)
66.	3188-20032	Univ. Texas Austin

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HP MINICOMPUTERS

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