ALR Revs Up MCA

The MicroFlex 7000 is a fast, expandable MCA clone, but is it better than an AT?

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Advanced Logic Research's MicroFlex 7000 combines the Micro Channel architecture (MCA) with a 25-MHz 80386 and a proprietary cache architecture to raise the performance ante for MCA machines. Its cache architecture is similar to that used in ALR's AT-compatible FlexCache 25386, which combines a high-speed static RAM (SRAM) cache with dual memory and I/O buses to let the 80386 CPU run with no wait states most of the time.

The MicroFlex 7000 cache differs from that of the FlexCache 25386 in two ways: It uses the MCA bus, and it moves data between the cache and main memory 64 bits at a time. While it uses the same 64K-byte cache of 25-nanosecond SRAM as the FlexCache 25386 does, the MicroFlex replaces the FlexCache's 60-ns DRAM with slower 80-ns DRAM.

The slower DRAM seems to cancel out the improved cache system to yield a processor/memory combination that is close to the speed of the FlexCache. That's not bad, however, because the FlexCache 25386 is the fastest IBM PC compatible that BYTE has reviewed.

A Lot of Box, a Lot of Money

The MicroFlex 7000's high performance and MCA bus do not come cheap; the Model 120-A21 (with a 150-megabyte hard disk drive) costs $8499, while the Model 300-A31 (with a 310-megabyte hard disk drive) runs $12,397. Standard features include 2 megabytes of DRAM, a math coprocessor socket, SuperVGA circuitry, a 1.44-megabyte 3½-inch floppy disk drive, and an ESDI controller. Software includes an ALR Reference Diskette that lets you configure MCA peripherals; Multisoft's Super PC-Kwik disk cache; and Quarterdeck's DESQview and Expanded Memory Manager (QEMM-386).

The Model 300-A31 evaluation system included three optional components. One was a VGA monitor, which BYTE supplied. ALR now offers a 14-inch VGA monitor for $499. The unit also came with an 80387 coprocessor and MS-DOS 3.3. (ALR now offers only MS-DOS 4.01.) With these extras, the evaluation unit costs a tidy $13,940.

Oddly enough, a MicroFlex 7000 Model 120-A21 with the same extras as our evaluation unit would run a far more reasonable $10,042. That means ALR is hitting you for $3898 for the additional 160 megabytes of disk space. We suspect that this is because ALR is pricing its

continued

ALR MicroFlex 7000

Company
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Components
Processor: 25-MHz 32-bit Intel 80386; socket for 25-MHz Intel 80387 or Weitek 3167 math coprocessor
Memory: 2 megabytes of 32-bit 80-ns DRAM in two 1-megabyte IBM PS/2-compatible SIMMs; 64K bytes of 25-ns static RAM for the cache; 128K bytes of 200-ns BIOS ROM
Mass storage: 1.44-megabyte 3½-inch floppy disk drive; 150-megabyte hard disk drive (Model 120-A21) or 310-megabyte hard disk drive (Model 300-A31)
Display: ALR 14-inch VGA monitor; VGA circuitry and DB-15 connector on motherboard
Keyboard: 101 keys in a modified IBM-Enhanced keyboard layout, with separate numeric keypad and cursor-control clusters
I/O interfaces: RS-232C serial port with DB-25 connector; DB-25 parallel port; AT-style keyboard connector; PS/2-style mouse connector; eight Micro Channel expansion slots (three 32-bit and five 16-bit)

Size
7½ by 17½ by 23 inches; 70 pounds (maximum)

Software
MicroFlex 7000 Reference Diskette and custom utilities; Multisoft Super PC-Kwik disk cache 3.23; Quarterdeck DESQview 2.25 with QEMM-386 version 4.23

Documentation
User's manual

Price
Model 120-A21: $8499
Model 300-A31: $12,397
System as reviewed: $13,940

Inquiry 852.

MicroFlex 7000 models to compete with comparable IBM PS/2s—the Models 70-A21 and 80. From that perspective, ALR's Model 120-A21 does reasonably well; it costs $451 less than IBM's Model 70-A21. The IBM system, with its maximum disk size of 120 megabytes and its meager three MCA slots, is also far less expandable than the ALR system.

Another MCA compatible, the 20-MHz Tandy 5000 MC, is a bit cheaper than the MicroFlex 7000: With a 170-megabyte SCSI hard disk drive and a smaller (32K-byte) cache, it costs about $200 less than the MicroFlex 7000 Model 120-A21.

The MicroFlex Architecture

Most cached 80386 systems, MCA or otherwise, use the Intel 82385 cache controller. ALR bucks this trend by implementing in discrete logic its own improved version of the 82385. ALR gains performance with this approach, but at the cost of quite a few chips on the motherboard.

The most important improvement of ALR's cache controller over the 82385 is in its handling of direct-memory-access writes. When a DMA write changes a memory location whose contents are in the cache, the ALR controller updates the cache data; the 82385 would simply mark the location invalid. ALR's cache also fetches 64 bits of memory when there is a cache miss. Because most memory accesses are sequential, prefetching the second 32 bits increases the cache's hit ratio.

ALR packages the main memory on two 1-megabyte single in-line memory modules that the firm claims are compatible with IBM's PS/2 memory modules. Because of the 64-bit-wide bus between the cache and main memory, the MicroFlex 7000's memory must come in pairs of SIMMs. With 2-megabyte SIMMs in the eight SIMM slots, the MicroFlex 7000 can handle up to 16 megabytes of DRAM. (ALR does not yet offer 2-megabyte SIMMs, but the company claims that the MicroFlex 7000 will work with IBM's 2-megabyte PS/2 memory modules.)

Performance

The result of this fancy architecture is an extremely fast system. The BYTE CPU, FPU, and text video tests place the MicroFlex 7000 about 20 percent faster than Compaq's 386/25 and within 1 percent of the performance of the FlexCache 25386.

On the hard disk tests, the news is not so good. Here, the MicroFlex 7000 Model 300-A31 is significantly slower than a FlexCache 25386 with a similar 300-megabyte hard disk drive. An ALR spokesperson said that the overhead of the MicroFlex 7000's emulation of the IBM PS/2 Model 70's hard disk drive and the fact that the BIOS checks the disk status after every read and write operation slow the performance. ALR plans to fix this in a future release of the BIOS.

Still, the performance of the MicroFlex 7000's 310-megabyte hard disk drive is not that bad. The system is about 10 percent faster than the 150-megabyte hard disk drive version of the FlexCache 25386, and it compares favorably with other MCA machines—it's about 50 percent faster than the 20-MHz IBM PS/2 Model 70-A21 and almost twice as fast as the Tandy 5000 MC.

Compatibility

Speed alone, of course, is not the whole story, especially with MCA systems. The system must be able to handle MCA expansion boards and run standard software. The MicroFlex 7000 does well on both counts.

It had no problems running a simple MCA internal modem (Computer Peripherals' Hook-Up PS2400). More impressively, it also worked with a bus-master card, Pixelworks' Ultra Clipper UM1280 high-resolution graphics card. The MicroFlex 7000 successfully ran a Pixelworks test that alternately exercises that video card and the ESDI controller, which is also a bus master. According to Pixelworks, this test can use as much as 50 percent of the MCA bus bandwidth. The MicroFlex 7000 also had no trouble with a Xircom Pocket Ethernet Adapter that attaches to the unit's parallel port.

It did not fare as well with a simple Microsoft Serial Mouse. When we tried to load the mouse driver software, the system claimed that no mouse was attached. An ALR spokesperson said the company plans to fix this problem by making minor changes to the MicroFlex 7000's motherboard, and that a Microsoft Mouse works with the MicroFlex 7000's built-in, PS/2-style mouse port.

The MicroFlex 7000 ran all the software we tried on it, including Borland's Quattro 1.0, Reflex 1.14, SideKick Plus 1.00A, SuperKey 1.16A, Turbo C 1.0, and Turbo Pascal 4.0; Digitalk's Smalltalk/V 1.2; Kermit 2.32/A; MicroPro's WordStar 3.3 and 4.0; Lotus's Symphony 2; Microsoft's PC Paintbrush 2.0, Windows/386 2.0, and Word 4.0; Norton Utilities 3.00; Novell's NetWare 2.15; and Symantec's Q&A 1.1.

In fact, the only software problem we found was a holdover from the FlexCache 25386. The MicroFlex 7000's FDISK program froze when we tried to make the penultimate partition of the 310-megabyte hard disk drive a full 32 megabytes. (You can work around this problem easily by making that partition smaller.) An ALR spokesperson said that the problem was due to an odd interaction between the DOS 3.3 FDISK

continued

ALR MicroFlex 7000

APPLICATION-LEVEL PERFORMANCE

WORD PROCESSING	Medium/Large
XyWrite III+ 3.52	
Load (large)	:11
Word count	:03/:15
Search/replace	:04/:14
End of document	:02/:08
Block move	:08/:09
Spelling check	:06/:38
Microsoft Word 4.0	
Forward delete	:11
Aldus PageMaker 1.0a	
Load document	:06
Change/bold	:16
Align right	:13
Cut 10 pages	:11
Place graphic	:03
Print to file	1:24
Index:	**3.54**

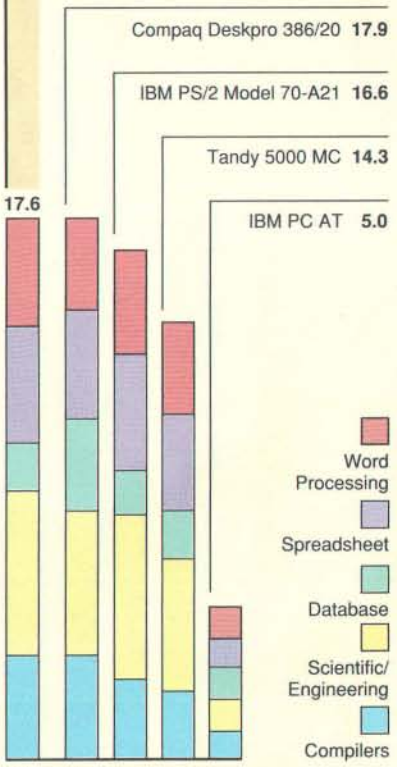
SPREADSHEET	
Lotus 1-2-3 2.01	
Block copy	:02
Recalc	:01
Load Monte Carlo	:14
Recalc Monte Carlo	:03
Load rlarge3	:04
Recalc rlarge3	:01
Recalc Goal-seek	:02
Microsoft Excel 2.0	
Fill right	:03
Undo fill	1:09
Recalc	:01
Load rlarge3	:14
Recalc rlarge3	:01
Index:	**3.82**

DATABASE	
dBASE III+ 1.1	
Copy	1:10
Index	:19
List	1:18
Append	1:37
Delete	:03
Pack	1:19
Count	:17
Sort	1:11
Index:	**1.50**

SCIENTIFIC/ENGINEERING	
AutoCAD 2.52	
Load SoftWest	:31
Regen SoftWest	:21
Load StPauls	:07
Regen StPauls	:04
Hide/redraw	7:00
STATA 1.5	
Graphics	:21
ANOVA	:10
MathCAD 2.0	
IFS 800 pts.	:10
FFT/IFFT 1024 pts.	:09
Index:	**5.45**

COMPILERS	
Microsoft C 5.0	
XLisp compile	2:40
Turbo Pascal 4.0	
Pascal S compile	:04
Index:	**3.30**

All times are in minutes:seconds. Indexes show relative performance; for all indexes, an 8-MHz IBM PC AT=1.



*Cumulative application index. Graphs are based on indexes at left and show relative performance.

LOW-LEVEL PERFORMANCE[1]

CPU	
Matrix	2.65
String Move	
Byte-wide	16.58
Word-wide:	
Odd-bnd.	22.60
Even-bnd.	8.30
Doubleword-wide:	
Odd-bnd.	16.47
Even-bnd.	4.15
Sieve	14.06
Sort	10.52
Index:	**4.99**

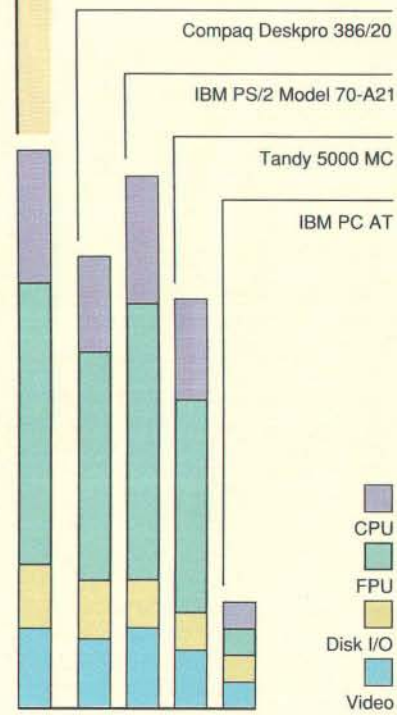
FLOATING POINT	
Math	4.87
Error[2]	0.00E+00
Sine(*x*)	1.66
Error	2.00E−09
e^x	1.82
Error	1.00E−09
Index:	**10.29**

DISK I/O	
Hard Seek[3]	
Outer track	3.33
Inner track	3.33
Half platter	6.67
Full platter	8.39
Average	5.43
DOS Seek	
1-sector	8.38
32-sector	16.86
File I/O[4]	
Seek	0.04
Read	0.89
Write	0.82
1-megabyte	
Write	2.97
Read	4.36
Index:	**2.41**

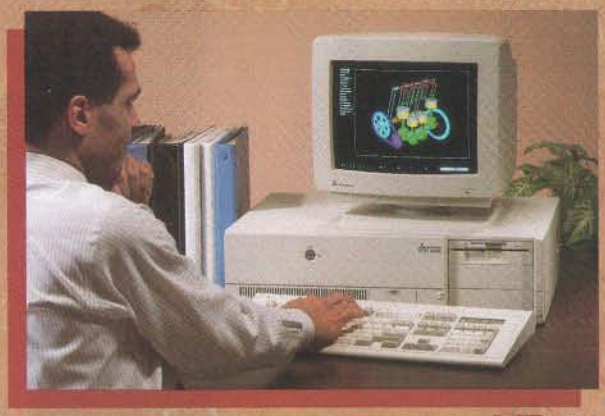
VIDEO	
Text	
Mode 0	3.27
Mode 1	3.18
Mode 2	3.54
Mode 3	3.55
Mode 7	N/A
Graphics	
CGA:	
Mode 4	1.19
Mode 5	1.16
Mode 6	1.33
EGA:	
Mode 13	2.27
Mode 14	2.85
Mode 15	N/A
Mode 16	2.78
VGA:	
Mode 18	2.96
Mode 19	1.25
Hercules	N/A
Index:	**2.97**

CONVENTIONAL BENCHMARKS	
LINPACK	135.33
Livermore Loops[5] (MFLOPS)	0.22
Dhrystone (MS C 5.0) (Dhry./sec.)	8278

N/A=Not applicable.
[1] All times are in seconds. Figures were generated using the 8088/8086 and 80386 versions (1.1) of Small-C.
[2] The errors for Floating Point indicate the difference between expected and actual values, correct to 10 digits or rounded to 2 digits.
[3] Times reported by the Hard Seek and DOS Seek are for multiple seek operations (number of seeks performed currently set to 100).
[4] Read and write times for File I/O are in seconds per 64K bytes.
[5] For the Livermore Loops and Dhrystone tests only, higher numbers mean faster performance.

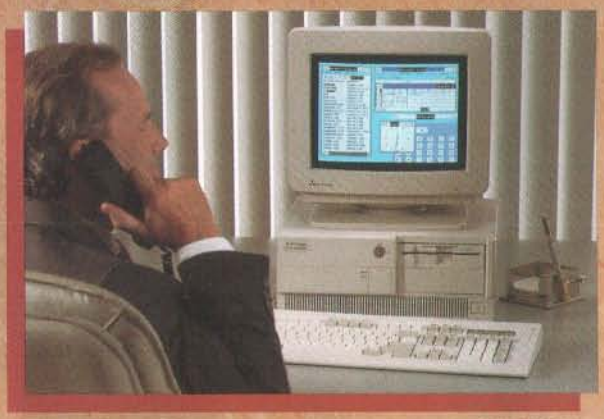


For a full description of all the benchmarks, see "Introducing the New BYTE Benchmarks," June 1988 BYTE.

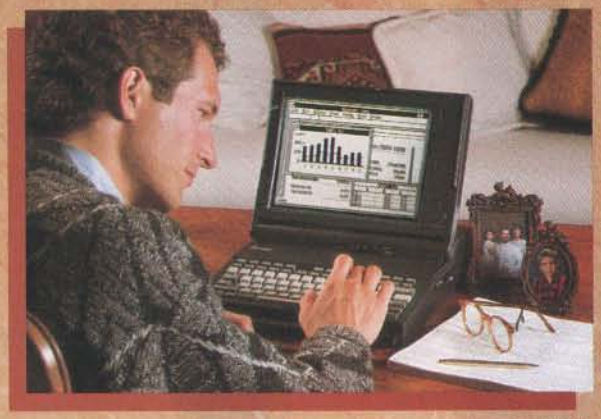


MP386

MP286



MP386s



mp286L

program and the MicroFlex 7000's hard disk subsystem.

Disk Space to Burn

The MicroFlex's hard disk drive is a 310-megabyte, 5¼-inch, full-height Control Data drive. An Adaptec ESDI controller with an on-board 32K-byte cache uses a 1-to-1 interleave with that drive; the combination delivers an average access time of 16 milliseconds.

The MicroFlex 7000 has two empty 3½-inch drive bays, plus two open 5¼-inch half-height bays. ALR offers as options a 1.2-megabyte 5¼-inch floppy disk drive and a 150-megabyte ¼-inch streaming tape drive. The system's standard floppy disk drive is a 1.44-megabyte 3½-inch Fujitsu unit.

The Wrapper

All this hardware is in a tower that can weigh up to 70 pounds. Getting into that box starts out easy: You remove two thumbscrews on the rear and slide off its left side panel. From there, however, the going gets tough. Just to insert an expansion card you must first remove a 3-inch-wide metal support that runs the height of the unit. Then you have to swing out a metal arm that holds the standard hard disk drive and one of the optional 3½-inch hard disk drives. Finally, you must remove a restraining brace that helps hold the expansion boards in place.

The MicroFlex 7000 has no pop-out components. It packages MCA technology in AT-style mechanical engineering.

This process illustrates the difference between an MCA compatible and a PS/2 clone. Unlike the PS/2s, the MicroFlex 7000 has no pop-out components. Instead, it packages MCA technology in AT-style mechanical engineering. Because PS/2s are much simpler to disassemble, users and in-house service organizations can easily add boards and replace and upgrade parts in their systems. ALR relies on its dealers to perform such tasks.

The reward for the journey inside the MicroFlex 7000 is eight MCA slots, only one of which—the uppermost 16-bit slot—is full; it contains the hard disk drive controller. Open are three 32-bit slots and four 16-bit slots.

The heart of the system is ALR's proprietary 14-inch-square motherboard. It uses Chips & Technologies' seven-chip Chips/280 chip set, which implements the MCA interface, the communications, and the 16-bit VGA circuitry. Even with these highly integrated chips, however, the motherboard contains an amazing 164 chips. The board was also fairly new; the 19 wires on its underside plainly marked many last-minute fixes.

The large chip count, by the way, does not include the memory on the SIMMs. Each 1-megabyte SIMM contains 12 chips, including eight 1-megabit memory

chips; there is no parity on this memory.

The MicroFlex 7000's keyboard controller and ROM BIOS (version 1.02.02) are by Phoenix Technologies. The ROM BIOS automatically steps down the effective speed of the system when it reads or writes to the floppy disk; otherwise, the MicroFlex 7000 does not offer any compatibility speeds.

Odds and Ends

The MicroFlex 7000's keyboard follows the IBM Enhanced keyboard layout, except that it places the backslash (\) key next to a reduced Backspace key, in the older AT style. This keyboard also uses an AT-style, rather than PS/2-style, connector. While the keyboard has a nice feel and an audible, mechanical click, we miss the switch on the back of older ALR keyboards that lets you swap the function of the Control and Caps Lock keys.

The MicroFlex 7000's Reference Diskette includes the Phoenix Reference Diskette, which provides an attractive, simple user interface for MCA configuration. The Reference Diskette also contains other useful software, including NetWare Ethernet drivers, a low-level disk formatter, and VGA drivers for programs such as AutoCAD, Ventura Publisher, and Windows. Drivers for the VGA's higher 800- by 600-pixel modes were not available at this writing.

The MicroFlex 7000's documentation is too technical for novices, containing such occasionally useful information as the pin-outs for the external connectors. It also has at least one error: Its list of ROM BIOS drive types does not include any disk drives over 300 megabytes.

Service and Assistance

The MicroFlex 7000 comes with a one-year parts-and-labor warranty. You can also buy from one to three years of extended warranty service, but it's not cheap: One extra year costs $600 for the Model 120-A21 and $680 for the Model 300-A31.

When the MicroFlex 7000 needs maintenance, you can mail it either to ALR or to one of Intel's 35 service locations. Intel will also provide on-site service within 50 miles of any of those locations for $30 per month.

ALR also gives you unlimited telephone support. The support people with whom we spoke were knowledgeable and helpful. Our only complaint is that ALR does not provide a toll-free number.

The Bottom Line

If you need a high-performance MCA server, the MicroFlex 7000 is currently your best choice. It has more expansion capability than IBM's PS/2 Model 70 and much greater performance than such other large MCA boxes as the Tandy 5000 MC and the IBM Model 80.

The big question is whether you need an MCA system. You pay more money, but BYTE's benchmarks don't show any performance gains over fast AT machines. Furthermore, few add-in boards are available to take advantage of the MCA bus, although IBM and other vendors have promised more.

If you do decide to purchase an MCA PC, the MicroFlex 7000 is a good, very expandable, high-performance option. ■

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