

*Dealers, distributors, and users across the country report AT problems, suspect several causes, and see some evidence of improvement.*

# *From Sea to Shining Sea . . .*

**H**ow serious are the maladies befalling the IBM PC AT? Since IBM considers the failure rate of the components a proprietary—not to mention embarrassing—matter, it wouldn't tell us, and so *PC Magazine* took a different tack to find out. We talked with major computer stores, value-added resellers, corporate buyers, and users for an indication of the scope of the problem.

The reports that came back from interviews across the country indicated that the most prevalent problems, in descending order of significance, are with the AT's 20-megabyte CMI hard disk drive, the Western Digital controller board, and possibly with a combination of the two in the same machine.

Our reports show that no one managed to match *PC Magazine*'s 240 percent failure rate for hard disk drives: among the five ATs in-house or used by editors at home, a total of 12 dead drives including replacements. One reseller found a 60 percent failure rate on one shipment of 50 CMI drives. Many reported failure rates considerably lower, but high enough to be of concern. Some reported minimal problems. Several dealers observe that problems were worse in the AT's earlier

days and that IBM was responsive to the problem, quick to honor warranty claims.

Sensitivity to IBM's size and clout led a number of dealers and suppliers to share private concerns about the AT's reliability but to go on the record with "no comment." No one suggested pressure as the reason for silence, merely allegiance to the cardinal rule, Don't bite the hand that feeds you.

**THE BIGGEST FRAUD** After *PC Magazine*'s experience, the hardest luck story belonged to Al Stone, a principal in the computer services division of a Long Island, New York, company that distributes computer components to dealers and original equipment manufacturers, including hard disk drives for owners of

## ■ REPORTS ON PC AT PROBLEMS

unenanced PC ATs in the greater New York area.

"I believe that the CMI drives are one of the biggest frauds ever perpetrated on the American public," Stone says.

"Computers are a business and a hobby for me. I've been president of the Long Island Computer Association, and

statistics on AT failure rates. Businessland even recommends the CMI, along with disks from Tandon and Seagate, as an add-on hard disk for the PC and the XT. And one leading subsystem manufacturer is currently leaning toward installing CMI disks in its units.

Al Harding, who owns Computer Land stores in Santa Fe, New Mexico, and Lubbock, Texas, estimates that the AT originally had a 20-percent failure rate but says the rate has improved in the last few months. His strategy hasn't changed, however. "We had a lot of breakdowns, so we started putting in our own non-CMI disks," says Harding. "We put in disks with 40 and 70 megabytes. It gave us a better profit margin and

card was a manufacturing defect. On the IBM AT hard disk, initially we had a lot of problems. Now they're going away, although the AT disks seem to be a little bit more fragile than normal hard disks." Comments a dealer in San Mateo, California, "We don't keep percentages; . . . when there's a failure, most of the time it's disks or disk controllers." And another in San Jose, California, says, "The ATs that we're seeing right now have cleaned up their act. The failure rate now is about the same as with PCs—not significant. When we first had them, the failure rate was about 50 percent. If anything does go wrong, it's usually the controller card."

**CONTROLLER'S FAULT?** Joe Castoro, a seller of medical vertical-market systems in Coram, New York, says, "In my opinion, CMI did not make the best piece of apparatus, but the major problem with ATs lies with the controller, either in timing or data separation. You can't find an accurate place to lay the blame. It's partly with IBM and partly with CMI. If IBM's controller were more reliable, you wouldn't have such problems with the disk.

"Even with a lower-end hard drive," Castoro says, "the controller can make up for a lot of sins. It can recover from read errors. With the AT, there were a lot of nonrecoverable errors. A good controller can make a lower-end disk—CMI's or anyone else's—less of a problem."

Castoro says he is shying away from using ATs in any configuration unless the customer insists. He prefers to use a PC, PC-XT, or PC-compatible with an accelerator card to match the speed of an AT. If a customer needs an AT-compatible, Castoro recommends using a Sperry: "It's faster and more reliable; . . . there

**"I don't think the problem has anything to do with the disk controller. I've seen CMI drives fail on Xebec and DTC controllers, too. They fail just as readily in an XT as in an AT."**

**a distributor**

I saw the opportunity to be a major supplier of CMI drives in the Northeast as a chance to grab the brass ring. I was hurt by this. A lot of little guys were hurt very badly.

"In one 50-unit order of 20-megabyte CMI drives," he laments, "I had 30 defective or dead on arrival.

"I don't think the problem has anything to do with the disk controller. I've seen CMI drives fail on Xebec and DTC controllers, too. They fail just as readily in an XT as in an AT," Stone says. "The CMI exhibits a lot of temperature sensitivity. If you format the drive when it's cold and then write and read when it's warm, it's a fact you're going to get lost clusters."

Some of Stone's evidence is circumstantial. For instance, he says, "We were supplying drives to Novell for use in a large networking system. There were problems that Novell couldn't solve; it thought it had software bugs. We switched to another brand of drive and the problem went away."

**USED TO BE A LOT WORSE** None of the larger computer chains—Businessland, Entre, ComputerLand, or Sears Business Centers—says it keeps hard

gave the customer more horsepower. Now that the machines work better, we haven't switched back."

"The failure rate used to be a lot worse," says Mark Mitcham, senior marketing representative for Businessland in Albuquerque, New Mexico. "The number of pure IBM systems we sold is almost nil. We built most of them up ourselves. And while the failure rate has gone down considerably in the last 6 months, any time that an AT goes out the door, its chances of coming back are greater than for any other machine. Compaqs are a lot more reliable."

An Entre salesman says the AT fails "no more and no less than any other IBM product."

Many dealers commented; some didn't want to be identified beyond their hometowns. Richard Bell of Seattle says, "The AT failure rate is less than 10 percent. For a while it was higher, 15 percent. . . . IBM has now corrected the problem."

Gary Nielsen of Phoenix, Arizona, puts it this way: "The problem with the controller

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**marketing rep., retailer**

## THAT SINKING FEELING

*Core International's outspoken president, Hal Prewitt, makes good on his promise to give AT drives a burial at sea—and takes IBM to task.*

**B**oaters and fishermen off the coast of Florida should update their charts to indicate a new navigation hazard: CMI Reef. In late February, a crew of Core International workers steamed into the Atlantic with a cargo of crashed Computer Memories Inc. (CMI) hard disks. A mile east of Boca Raton ("in plain sight of IBM's sales offices," notes 31-year-old Core president Hal Prewitt), the boat, a 46-foot fishing craft aptly named the *Megabyte*, hove to. Prewitt reached down, hefted an original IBM-issue AT hard disk from a gleaming pile in the middle of the deck, and tossed it

into the drink. It made a frail glugging sound, sort of like an IBM executive swallowing hard.

Prewitt's shipmates pitched in, flinging the dense metal canisters over the rail. After many minutes, the pace slowed to a crawl. It's hard work, throwing disk drives in the ocean.

The sea floor is not normally the home of so many high-capacity, 40-millisecond hard files, especially when they're chock full of data. Archaeologists from the 30th century will have a field day exploring this site. Until then, the hardware will, in the words of Mario Puzo, sleep with the fishes. This was certainly in the back of Prewitt's mind when he devised the stunt. Why does someone throw a million bucks' worth of computer parts

overboard? "Because we guess they're good for fishing," he says wryly as another CMI splashes into the sea. "We already know they're not good for computer data."

person. "It's generally our feeling that it was just a bad drive. It's unfortunate that it was ever sold. I would never recommend that anybody ever use that drive in their computer system, and if they can

get rid of it, they should take the time and do so."

The way he sees it, "The drive simply exceeded its overall design capabilities. It tried to get too much out of too little." Instead of dedicating an entire hard disk platter surface as an electronic road map for the heads, CMI's wedge-servo technique cut corners by packing small bits of positional information in with the data itself, according to



*"CMI Reef" might provide a better home for fish than these drives did for data.*

For 3 months in 1985, Core ran full-page ads slugged "The Great Recall" in every PC-oriented magazine. "Boca Raton, home of the IBM PC, needs a fishing and diving reef, too," the copy smirked. "Help us build the world's first low-technology artificial reef." The deal was that if you bought one of Core's 40-megabyte hard drives (for \$2,595), then plucked your original 20-megabyte drive from the AT chassis and shipped it back to Core's Boca Raton plant, the company would mail you a check for \$1,000. And it would deep-six the CMIs that were returned, "simply because that's where they belong."

Well, the ad didn't exactly name CMI in black and white. But Prewitt doesn't pull any punches when you ask him in

Prewitt. Rather than use a fast, accurate voice-coil to move the heads, CMI relied on yesterday's clanky stepper-motor technology and an optical feedback device that could be easily thrown off by contamination inside the drive "like a hand in front of your eyes." Unfortunately, the contamination was usually in the form of little pieces of your data floating on oxide dust kicked up when the heads plowed tiny furrows into the surface. This happened all too often, since the CMI drive didn't automatically retract the heads when the power turned off; instead they would drop down and sometimes take a bite out of whatever data they happened to be hovering above. Prewitt says he considers automatic head parking and locking to be

(*"That Sinking Feeling" continued*)

"the single most important feature a disk drive should have in a small business-computer system."

Although Prewitt is one of the largest authorized IBM dealers in the Southeast, he thinks IBM "has made a lot of mistakes. There's no question about that. . . . For the first time users are willing not to buy a 100 percent IBM system after getting burned so badly. Today all computers are created equal. . . . What you should really look for is knowledge and experience and quality. That's what made IBM famous. That's what made IBM successful. They delivered one-stop

shopping, the total solution. IBM has gotten away from that. They now concentrate on being the low-cost volume producer—and you don't see the word quality in there.

"They've done a lot of things that are very nice," Prewitt is quick to admit. "The general design of the machine is one of a very good, well-thought-out architecture. But if you're not a computer expert yourself, you have to depend on somebody for information. And unfortunately you can't get that from IBM these days. The company has never been structured to handle that on the small-end marketplace. You could get it if you had a

million-dollar computer, but you don't get it if you are buying PCs."

Back when IBM was designing the AT, says Prewitt, CMI was making the only 40-millisecond drive available at an extremely good price. "The closest competitor was at least double the cost, so they really had no competition." And, anyway, as Prewitt reminds us, "you gotta remember the IBM/CMI connection. IBM owns part of Intel, and Intel owns part of CMI."

These days IBM is manufacturing its own 20-megabyte AT drive in its Rochester, Minnesota, plant, with voice-coil technology, heads that retract automati-

## “ADMITTEDLY, THERE WERE SOME PROBLEMS”

*A spokesman for CMI says the small company was overwhelmed by the IBM order and has now corrected the production problem.*

**W**as the reputation of Computer Memories Inc. unfairly blackened by l'affaire IBM? Yes, says at least one observer—CMI itself.

"An unfair number of complaints related to the integrity of the IBM system were laid at the doorstep of the CMI disk drive," says John Trifari, a spokesman for the Chatsworth, California, company. "When you get an error message on-screen, it doesn't say there's a controller problem or a computer problem—it says there's a disk problem."

"Admittedly, there were some problems when the company started up. This was a small company that had a finite production capability and it was called upon to deliver very large quantities of disk drives," he says. CMI almost tripled in size in 1985, primarily because of the IBM contract, according to Trifari. It went from a \$47-million-a-year company in the fiscal year ended March 1984 to one whose peak revenue was \$50 million in the second quarter of 1985.

IBM contracted with CMI for 240,000 model 6426 two-platter, four-

head, 5¼-inch, 20-megabyte disk drives through the end of 1985, Trifari says, and ordered an additional 8,000 in October 1985 (an indication that IBM wasn't unhappy with CMI's product). That order accounted for 60 percent of CMI's business during the course of the contract.

According to Trifari, the problem with CMI drives was a linkage to the read/write heads that came unaligned in shipment, causing the drive to go off track. CMI strengthened the linkage and developed a "drive electronics reporting position" facility to help the read/write heads find track 0 regardless of linkage problems.

"That problem was corrected," Trifari says. "We feel the problems have been resolved that related to the drive."

CMI actually had one other problem with the drive—patent litigation over its design. In an out-of-court settlement with Quantum Corp., CMI has agreed to stop making the troubled 6000 series (20.9-, 31.5-, and 41.9-megabyte drives) as of the end of April 1986. (CMI will then make only a new 7000 series of 53- and 85-megabyte drives.)

Until recently, anyone who bought a PC AT with an official IBM 20-megabyte hard disk got a CMI 6426 drive. Some ATs still in stock contain CMI drives. The 6000 series drives were, and are, also sold to distributors and mail-order houses.

CMI notes that IBM violated its own rule when it chose CMI to make the drives: Never use a single source for components. "So, when there were difficulties with the system," Trifari says, "IBM was forced to put the [hard disk] AT on severe allocation."

Until the AT came along, Trifari says, "The industry was essentially 10-megabyte, 85-millisecond [access time] drives, stepper-motor driven, the type in the XT. All of a sudden, there was a tremendous demand for high-capacity, 40-millisecond drives that were available only in limited quantity from a few suppliers. Any company called upon to make drives in those quantities might have had problems."

"CMI really deserves a pat on the back for the way it pulled it out," Trifari says. "The drives really work well now."—**Bill Howard**

cally, and a dedicated servo positioning surface. But if your current CMI drive goes south, don't expect an IBM-made upgrade, cautions Prewitt. "All they're doing is putting the same drives back in. If you get lucky, maybe they'll put in the Rochester drive, but there's a good possibility you'll just get a refurbished CMI drive, or the other standard IBM drives that have had problems too. Actually, IBM's drive has been in existence for quite some time. It's just that it took quite a while to work all the kinks out of it."

**SHARING THE BLAME** Prewitt is so sure CMI disks will fail that one of his favorite slogans is "Not If But When." Still, while most critics acknowledge that ATs are not exactly the most problem-free computers IBM has ever stamped out, the blame is often spread around the industry. Nervous AT component suppliers point their fingers in lots of directions. Some claim the controller is the real culprit, or the power supply, or DOS, or, if they run out of villains, the users themselves. "They're kicking the machines. Dropping them."

The hard disk controller was indeed buggy, says Prewitt. It had to do with a chip—a PAL, I believe—that had a floating circuit and under certain conditions could cause some erroneous information to be transferred to the drive. But we were never able to document a single failure absolutely caused by that chip and that controller. However, IBM certainly did the right thing by having the controller card recalled and replaced. We didn't feel it was the major problem. It was also relatively inexpensive for them to replace the controller card compared to recalling and giving you a different disk drive. We believe the reason they didn't do it with the drive is simply the cost."

What especially irked Prewitt was the way IBM handled the problem. "Early on IBM denied there was a problem in the drive. . . . They just looked at it and said, 'No, you guys are all wrong, there's nothing wrong with the drive.' And then when they realized there was a problem and stopped the AT production line in January, their comment was, 'Well, you

can't get enough ATs because there's a shortage of disk drives from our primary supplier.' The one thing they left out of the January statement was that they couldn't get enough drives that *worked* in the ATs."

But while no Big Blue representative has yet gone on the record and admitted the problem, Prewitt's internal IBM contacts have told him a different story. "I have never spoken to an IBM technician or engineer in Boca . . . who denied there was a problem with the drives. They did tell me there was a problem, that they were working at it hard, and that they were going to fix it. They really stepped up a tremendous amount of testing. They had CMI open a repair facility here, and at one time there were literally tens of thousands of disk drives that IBM had rejected that had to be totally remanufactured for a lot of reasons. If you open your AT and you have a CMI drive in it, you'll notice it typically has a green and a red dot on the front. Some have multiple red dots. Those color codes identify the amount of failures that the drives experienced in internal testing."

The defective CMI drives piled up quickly. "After IBM realized there was a problem, they tried to screen out drives that had a high probability of failing," reported Prewitt. "I would generally guess that it wouldn't have been uncommon to experience a failure rate well into the 95 percent area. Actually, for most manufacturers, it's not unusual to have a failure rejection rate of anywhere from 15 to 30 percent, or even 50 or 75 percent from time to time." Still, 19 duds out of 20 doesn't seem like anyone's idea of high-quality merchandise.

Prewitt says part of the problem is that users don't understand that high-performance disk drives are complex, high-strung devices requiring extensive diagnostic testing. "If you buy a drive directly from a manufacturer or from a

mail-order house that's just supplied directly from a manufacturer, there's at least a 20 percent chance it will fail, or not work, within the first 90 days. Many vendors do no testing whatsoever on the

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president of a hard disk manufacturer

drives. They simply treat them like other circuit boards or monitors."

While Prewitt originally hoped that he'd end up with "thousands" of returned drives, fewer than a thousand actually made it over the side. Interestingly, when the promotion was in full swing (it ended in January of this year), he was contacted by "just about every disk drive repair house in the country, wanting to purchase the broken CMI drives. They get thousands of them in for repairs and they desperately needed the parts to try to repair the broken drives."

Core's future plans include releasing its drives for machines made by AT&T, Hewlett-Packard, Compaq, and others. Prewitt also expects to announce a half-height 40- or 50-megabyte, 26-millisecond drive. And he told *PC Magazine* "not to be surprised" to see a high-performance Core controller with an interleaf factor of 1, which would speed up the operation of any hard disk. He had planned and announced a Core-labeled AT called the Atomizer but put its production on hold "due to conditions in the marketplace." However, Prewitt may eventually go ahead and release it later this year. He has his hands full cranking out replacements for aggrieved AT hard disk crash victims. Or, as he likes to put it, "We've become the IBM of the disk drive market."—Paul Somerson

**T**he problem with the controller card was a manufacturing defect. On the IBM AT hard disk, initially we had a lot of problems. Now they are going away, although the AT disks seem to be a little more fragile than normal hard disks.”

**a dealer**

cloud in the background.”

Joe Jaworski, president of Peripheral Concepts, an Irvine, California, independent market-research firm, says the AT problems were traced to some circuit design systems in the controller board that resulted in data separation, along with a faulty TI gate array.

“There were no specific technical problems with the [CMI] disk that I know of,” says Jaworski. “It was just responding to erroneous signals.”

But, Jaworski says, “when a company does one level of business and a customer comes along and increases its order by 100 percent or more, there will be problems.” When problems developed, IBM gave CMI “a ton of money” to clean up quality control and improve efficiencies.

“This market is really dynamic,” he says. “There have been worse screwups by other companies that have survived.” Or as Shearson Lehman Brothers said in an investment advisory, “We would be inclined to look at companies with more clearly defined futures.”

Ed Marinaro, executive vice president of Western Digital, says his company “has never publicly acknowledged” that its products are in the IBM PC AT. Asked about the AT-compatible controller cards Western Digital manufactures, which anyone—IBM or an individual—could put in an AT, Marinaro says, “This class of product has been extremely reliable, with one of the lowest failure rates that we have ever seen, about .003 percent.”

How did word get out that Western Digital supplies the controller for the AT? “People opened up the machine and recognized our chips,” Marinaro says. “But we won’t acknowledge being with any specific customer. We respect our customers’ privacy and their security.”

Both Western Digital and CMI have their names or initials on the circuit boards, chips, or drive casings for easy identification.

**LOOK INSIDE BEFORE BUYING**

Consultant Dan Sanguinetti, president and CEO of PC Professionals in San Francisco, says he won’t touch an AT with a CMI disk. He believes anyone buying an enhanced 20-megabyte AT from IBM should open it up and look inside, only accepting the machine if it has a drive from IBM or Seagate. (CMI only sold 20-megabyte drives to IBM; the 30-megabyte drives are made in-house by IBM or by one other maker, not CMI.)

Sanguinetti blames dealers for much of the AT confusion. When the problem first became apparent, he says, IBM sent dealers a controller-card diagnostic program with instructions to contact all customers who bought ATs. Some dealers didn’t bother, causing some AT owners to think they had a disk problem. “If people weren’t serviced, it was the dealer’s fault, not IBM’s,” Sanguinetti says.

Sanguinetti says IBM was quick to replace bad disks. “If it’s an IBM-installed CMI, it gets replaced quickly. If it’s a disk bought directly from CMI and installed by the user or dealer, then it takes a month and a half.”

Overall, Sanguinetti estimates a 35 percent failure rate for ATs with a CMI disk.

**IBM: COOPERATIVE** Bruce Grant, director of technical support for Microage computer stores, says IBM was cooperative in handling the disk problem. “The whole processing time was longer than we wanted, but in retrospect, we applaud IBM’s handling. The company said we blew it and corrected the problems. Other than the hard disk, problems with the AT have been minimal.

“You can say that this kind of thing shouldn’t happen because IBM is so big,” says Grant. “But I can see the other side of the coin. With any other manufacturer, this would be normal operating procedure. It was a royal hassle at the time, but IBM made good. Not every company is like Hewlett-Packard, with a zero failure rate.”

Grant calls the AT problems a textbook case of demand pulling down production. There was such a market for the AT that the quality-control mechanism broke down. “For a smaller vendor, something like this is routine. With IBM, it turned into a crisis of major proportions,” he says. “If you or I have a bad day, it’s no big deal. If IBM has one, it’s a shot heard round the world.”

A technical executive for a company that supplies components to IBM says buyers of non-IBM AT-compatibles, especially bargain units from the Far East or those sold through mail order, may be-

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**a distributor**

gin to experience some of the AT’s disk/controller problems. The cause? Using components with marginal tolerances. “When these machines have some of the length of service in the field the AT has, you’re going to see the same breakdowns, possibly worse,” he says. As for the AT’s problems, he says his company believed weaknesses in the CMI drive

and Western Digital controller amplified each other—but that ultimately the failure was IBM's because customers buy an IBM machine regardless of where the components originate.

**“The general design of the PC AT is one of very good, well-thought-out architecture. But if you're not a computer expert yourself, you have to depend on somebody for information. And unfortunately you can't get that from IBM these days.”**

**president of a hard disk manufacturer**

Richard Brown, president of Express Systems in Schaumburg, Illinois, who is involved in direct sales, calls the AT problems “old news.” Brown made arrangements with Control Data for what he called “gold-plated drives” to protect his customers.

Jim Stevenson, president of Strategic Planning Corp. in San Diego, says his AT had a bad file allocation table and that reformatting at a lower level solved the problem. (*PC Magazine's* experience has been that reformatting may only postpone the day of reckoning.)

**GENERALLY RELIABLE** Robert J. Rush, vice president of the New York Life Insurance Co. in New York City, says his company has 510 IBM personal computers, 163 of which are ATs. He calls the ATs generally reliable, although the company had some minor problems initially. Not including these setbacks, Rush reports less than one service call per year for each machine. “We've had certain electrical and mechanical problems,” says Rush. “But this kind of thing only affects business when you're out of business, and that hasn't happened here.”

Some mail-order suppliers who sell

CMI drives swear by them, not at them.

Doug Sharpe, manager of technical support for Qubié, notes that the drives were built to IBM's exact specifications, so it wasn't CMI's fault that the specs weren't compatible with the rest of the machine. Qubié uses the CMI drive and likes it a lot.

John Hoover, national sales representative for PC Source, a mail-order house, sells the CMI drive as a straight AT update. They sell well, and the company offers a 1-year warranty. Hoover feels the AT's problem stems from a lack of disk compatibility with DOS 3.0. The drive itself works well; he blames the controller card.

**“IBM DIDN'T FESS UP”** Lynn Wilson, a programmer for Electronic Data Systems in Albuquerque, bought the original AT and had what he describes as “the classic hard-disk problem.” He says, “IBM didn't fess up that there was a problem. When you're plagued with this, you don't know if what's wrong with your machine is *the* problem or something else.”

Wilson's machine also had a bad motherboard component. IBM wanted \$300 for the repair; Wilson, who has an M.S. in electrical engineering, instead took a wiring gate and made his own part. Such homebrewed solutions are not part of the average user's arsenal, and the question is, why should they be?

“No one would tell me anything. I had two choices: panic or wait around. This attitude bothered me more than having the hardware fail,” Wilson says.

**“STILL A SAFE BET”** Is IBM in trouble over the AT? Perhaps, but only in the short term. Kip Myers, vice president of marketing for Plexus Computers of San Jose, California, says, “The average person is trying to cover his ass when making a purchase, and IBM is still a safe bet.”

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512K RAM (Up to 1M on Board) 1.2 M FLOPPY - FLOPPY & HARD DISK CONTROLLER AT KEYBOARD - CLOCK WITH BATTERY BACKUP 195W POWER SUPPLY - DOS 3.10 & MANUAL			

PC-AT COLOR	SAMPLE	5-49	50+
	<b>\$1899.00</b>	<b>\$1799.00</b>	<b>\$1550.00</b>
SAME AS ABOVE WITH COLOR MONITOR AND COLOR/GRAPHICS CARD			

PC-XT TURBO	SAMPLE	10-99	100+
	<b>\$999.00</b>	<b>\$896.00</b>	<b>\$595.00</b>
640K RAM, 8088-2, (4.77 MHZ or 6.66 MHZ) 360K FLOPPY - KEYBOARD - MONOCHROME/ GRAPHICS PRINTER - 12" TTL HIGH RES MONITOR			

PC-XT	\$899.00	\$595.00	\$495.00
	256K RAM - 360K FLOPPY - KEYBOARD MONOCHROME/GRAPHICS/PRINTER CARD (Hercules Comp.) - 12" TTL HIGH RES MONITOR		

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XT 20 MEG INTERNAL 1/2 HEIGHT	\$479.00	\$425.00
AT 1.2 MB FLOPPY	\$149.00	\$129.00
AT 20 MEG INTERNAL 40 MSEC	\$579.00	\$565.00
AT 30 MEG INTERNAL 40 MSEC	\$679.00	\$595.00

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135W POWER SUPPLY	\$51.75	\$45.00
FLIP-TOP CLONE BOX	\$26.45	\$23.00
MONO/GRAPHIC/PRN (Herc comp)	\$52.90	\$46.00
KEYBOARD	\$36.80	\$32.00
FLOPPY DISK CONTROLLER	\$23.00	\$20.00
RAM KITS 256K	\$26.30	\$22.00
12" TTL HIGH RES MONITOR	\$85.00	\$80.00

SUBTOTAL BASIC PC NO DRIVES **\$360.70** **\$313.00**

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OCEAN FREIGHT	\$24.00	\$20.00
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<b>TOTAL LANDED COST, L.A. HARBOR</b>	<b>\$470.40</b>	<b>\$380.80</b>

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MD-3 14" COLOR RGB	\$381.00	\$276.00	\$235.00
.39 DOT 640 x 200			
MD-7 14" COLOR RGB	\$490.00	\$359.99	\$335.00
.31 MM DOT 720 x 350			

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PC-XT-640K TURBO 4.77/6.66 MHZ	\$99.00	\$95.00
TRANS-NET (LAN)CARD 1.0 MHZ	\$199.00	\$185.00
384K MULTI-FUNCT (AST6 comp)	\$86.70	\$58.00
RAM KITS 384K	\$36.80	\$32.00
MODEM CARD 300/1200 (Hayes comp)	\$115.00	\$105.00
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## IBM AT HARD DISK DIFFICULTIES AND ALTERNATIVES

*Winn L. Rosch explains what's wrong with the CMI drive and suggests some alternatives.*

**O**f all the shortcomings of the IBM AT, only one is genuinely lethal to both your data and your mental health—the unbelievably fragile hard disk that IBM stuffed (and sometimes still stuffs) into its enhanced 20-megabyte PC AT models.

Made by Computer Memories Inc., the AT hard disk is an innovative design called “wedge servo” that gives the extremely fast access times normally earned with a servo/voice-coil mechanism (under 40 milliseconds) at a lower price, comparable to that of slower, cheaper band-stepper-motor technology.

The primary problems with the CMI hard disk apparently are caused not by its innovative technology but by subsidiary design considerations. The CMI drives use an oxide-coated disk surface or medium, which is a lower-cost alternative to much tougher thin-film media that are fast becoming popular in other companies' high-performance hard-disk drives. The ready availability of oxide-coated platters helped CMI fulfill the overwhelming and unanticipated initial demand for the drives. However, because the oxide coatings of such disks are inherently soft, they are very susceptible to damage caused by head crashes.

**NO PARK-AND-LOCK** The delicate nature of the soft-medium problem was aggravated by the lack of a park-and-lock feature, which automatically retracts the read/write heads away from the part of the disk surface used for storing data and secures them while the power is off. With such mechanisms, an inadvertent jar of the mechanism will not cause the head to scrape across the data area and damage it (assuming the machine is no longer running).

The result of these twin shortcomings left the standard IBM 20-megabyte drives extremely susceptible to damage from merely bumping the machine. Furthermore, because the heads in these disk drives often landed on parts of the disk surface where important data might be stored, jarring the drive or moving the host computer—even when it was turned off—can and all too often does damage files stored on the disk. Worse yet, as John Dickinson recounts in his introductory article, “Courting Disaster: The IBM PC AT,” this damage does not show up immediately after it originally takes place but might become apparent only weeks or months later, when you attempt to access the damaged file(s). Should the damaged area of the disk ex-

tend into the file allocation table, the entire disk can be rendered unusable—and irreparable. The only safeguard at your disposal is to make numerous and frequent hard disk backups.

**HARD DISK ALTERNATIVES** Instead of fixing these problems, both IBM and CMI have denied them and have chosen instead to replace drives as they die, which does you little good when you lose a hard disk full of data. The best solution, then, is for AT users to look at the alternatives.

Fortunately, a number of companies now offer replacement add-in hard disks (as well as alternative drives to enhance entry-level ATs) that overcome the shortcomings inherent in the official IBM hard disk drives.

Among the first companies to recognize the AT hard disk problems was Core International, which collaborated with veteran hard disk maker Control Data to make a series of extremely robust drives with the park-and-lock feature built-in. (Core even claims to have coined the term *park-and-lock*.) Although the Core drives use the more sensitive oxide-coated media, their much sturdier, more expensive, and faster servo/voice-coil head-positioning mechanism has thus far proven itself resistant to head crashes. The company currently offers a full line of AT replacement drives with formatted capacities from 20 megabytes to about 60 megabytes, all now rated at a racy 26-millisecond average access time. The drives with capacities over 32 megabytes are supplied with replacement ROM chips to help DOS and the AT deal with larger amounts of disk storage.

The Systems Division of Priam Corp. also manufactures (and sells under its own name) a line of hard disks designed for installation in the AT. These drives, which use plated media and voice-coil

### PC AT Hard Disk Installation Made Easy

*It takes less than 15 minutes to install a hard disk.*

**D**isk drive suppliers have been cashing in on just how easy enhancing an AT can be. Anyone with a screwdriver can add a hard disk to an AT in less than 15 minutes.

The process is amazingly quick and easy. Once you slip the cover off your computer, you simply have to remove the two screws from the retaining

brackets at either side of the drive slot. The hard disk then slides into the slot on its guide rails. Before securing the drive, you connect the three cables and the ground wire to the rear of the drive (the connectors are keyed so that they cannot be improperly inserted). Screw everything back together, and you're done.—Winn L. Rosch



technology, have proven themselves very quick and resistant to head crashes. The Priam line comprises three drives with capacities of 24, 42, and 60 megabytes (formatted), which are available through dealers.

**MAIL-ORDER MUSCLE** Several mail-order suppliers now sell hard disks under the original disk manufacturer's name; many of the more popular ones are made by Seagate. Seagate manufactures a whole line of products that includes both low- and high-performance drives. The higher-performance models feature both thin-film media and park-and-lock. Like the Core and Priam drives, the Seagate units can almost be treated like brick and can withstand substantially more abuse than the IBM original-equipment CMI drives. Some mail-order suppliers offer similar high-performance drives from manufacturers like Tandon and Rodime.

You might want to avoid one brand name when buying a replacement or enhancement for your AT. Some suppliers are offering exact replacement AT drives manufactured by CMI. While these drives have the de facto IBM sanction, they also come with the same worries that come with the original 20-megabyte enhanced AT.

When buying a disk drive from a mail-order supplier, remember that hard disk manufacturers usually will not support users. They deal only with distributors and companies that put their drives in other products. You will have to depend on the mail-order supplier for support, so make sure that you buy from one that is dependable and has a responsible service program or return policy.

**THE HEAVYWEIGHT DRIVE** A growing number of AT users are adding Iomega Corp.'s Bernoulli Box to their computers. The Box is a genuine heavyweight among personal computer disk drives because its bulk and technology yield almost complete indestructibility. You can literally pick up and shake a Bernoulli Box while it is operating and the disk will not suffer damage—or even

miss a byte. The Bernoulli Box is also faster than most hard disks at reading and writing long files, and because it uses removable cartridges it can be used to back up itself or other disks and store them securely. Disadvantages include high cost, the need for an external chassis, a single source of supply, and, until recently, the inability to boot your system directly from it.

The newer 30-megabyte enhanced AT uses robust, IBM-manufactured hard disks that are comparable to those offered by Core. Although these drives are essentially free from the problems inherent in the CMI 20-megabyte unit, some users have noted that they are quite noisy. Moreover, the newer ATs that host the 30-megabyte drives have a built-in speed limit of 6 MHz that the original AT lacks. Installing a drive from another supplier can avoid these problems and save several hundred dollars (or more) along the way.—Winn L. Rosch