

SETTING THE STANDARDS

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BYTE

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PRODUCT FOCUS



**Multiuser
Operating Systems**

THE WORLD'S FIRST 486

*Fresh from the U.K.
Apricot's VX FT Server Leads the Pack*

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The 486s Are Here!

Apricot's VX FT Server is the first announced PC to use the new Intel 80486 CPU



While IBM and Compaq have been loudly engaged in a one-upmanship battle over who leads the market, Britain's Apricot has quietly introduced the first PC based on Intel's 80486 CPU. Unlike IBM's recently announced 80486 Power Platform upgrade for the PS/2 Model 70, the Apricot VX FT Server, based on the Micro Channel architecture (MCA), is an entirely new system with an external RAM cache. This cache memory provides a significant performance advantage over IBM's product.

Apricot has built an impressive machine. The prototype VX FT Server with a 25-MHz 80486 CPU is faster overall than any other 25-MHz PC and most 33-MHz PCs that BYTE has benchmarked. However, it is not cheap; prices range from \$18,000 to \$40,000. Designed as a high-performance file server, it could nonetheless prove economical for large network or multiuser installations.

Apricot configures the VX FT Server in two versions: the Series 400 for net-

work duties, and the Series 800 for multiuser Unix systems. They differ in RAM allotment and intelligent I/O ports (see table 1). Both versions provide multiple layers of data security. In Europe, an 80386 version is available in both series.

The Series 400 will be shipped with MS-DOS 4.01, although you can get the more powerful OS/2 Extended Edition as an option. The VX FT Server supports Novell NetWare, 3+Open, Microsoft LAN Manager, Torus Tapestry, and Apricot's own VXNet. SCO Unix System 3.2 is the chosen flavor for the Series 800. The 80486 machines will be available this month.

The model we tested was a Series 400/30 running MS-DOS 3.3. It had a 347-megabyte Maxtor SCSI hard disk drive, a 1.44-megabyte 3½-inch floppy disk drive, 12 megabytes of RAM, and, of course, an 80486 CPU.

The Box

Typical of Apricot PCs designed by Bob Cross, the VX FT Server is an unconven-

tional yet attractive box. It's also big, measuring 2 feet tall by 2 feet deep by 16 inches wide and weighing (in a typical configuration) 165 pounds. Two retractable handles at the top of the unit provide purchase for four strong hands. The VX FT Server stands on skids. Apricot thought that using casters would increase the chance of damage, even though the system would be easier to move. Gigabyte file servers should be bolted to the floor; the skids were a compromise.

A distinctive feature of the box's external design is a backlit LCD panel (handy during a power failure) above a row of buttons. Under software control, the buttons provide access status information about the VX FT Server and control the sliding door that conceals the drive bays below it. The monitor panel functions are under system security control.

There are removable panels on either side of the box that provide access to the

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inner workings of the VX FT Server. A physical case lock is backed up by an alarm that sounds if you remove the side panels without first establishing your access privileges.

The grill at the bottom of the system unit conceals an air filter and the fan for cooling the power module. Another fan in the rear panel takes heat from the motherboard and expansion bay. With all the noisily moving air, the VX FT Server is easier to live with in the corner of the room than under your desk.

The Power of the 80486

The VX FT Server's 6.7 CPU index bests IBM's 80486 Power Platform upgrade, which tested at 5.3, as well as all but two of the 33-MHz 80386 machines we've tested (for these results, see the upcoming *Inside the IBM PCs*, Fall 1989). Its 21.8 FPU index is unmatched; IBM's Power Platform scored a 21.4. The Apricot's disk index is a so-so 2.3, but its video index is a near-record 5.2 (see table 2).

But the real payoff is in the application area. Although we were unable to run all the BYTE application benchmarks, those we did run challenged or beat those of the

fastest 80386-based PCs. The only exception was the VX FT Server's subpar database index of 2.6. The database tests are disk-intensive. Apricot uses a SCSI hard disk drive rather than a faster ESDI unit for two reasons: The SCSI drive provides a greater throughput rate, and it lets you chain multiple drives off the same controller. If faster access times are needed, adding a hardware disk cache and a faster drive from a third party should be no problem.

The VX FT Server could not run all portions of the BYTE scientific/engineering tests, although the times for the tests it did complete suggest that it is significantly faster in this area than any other PC we've seen. An Apricot spokesperson said that some software would not run properly on the prototype 80486 CPUs from Intel and suggested that this could have been the cause of our benchmark problems.

The Qi to the VX FT Server

The VX FT Server is based on the MCA motherboard used in Apricot's Qi (pronounced "key") PC. The Qi has been sold primarily in Europe, although it and the VX FT Server are available in North

America through Apricot's Canadian distributor.

The company has integrated a number of I/O features on the Qi motherboard, including serial and parallel ports, a mouse port, Ethernet (both thick and thin wire), an analog VGA connector, and a bisynchronous communications port, which you can use as two additional serial ports (see photo 1). A second serial port is dedicated to the front LCD control panel. Additionally, Apricot has built security into the hardware by using a spare 8042 keyboard processor with its own CMOS RAM and real-time clock.

Chips & Technologies provides the MCA chip set that was developed with Apricot input. The BIOS is by Phoenix Technologies.

The motherboard, measuring 15 by 14 inches, fits comfortably into the system unit (see photo 2). It is the same one used in the other 80386 Qi models, but with an 80486 mounted on a daughtercard. (Unlike the IBM PS/2 designs, the 80386 CPU in the Apricot sits on the motherboard, not on a daughtercard.)

The daughtercard holds the 80486, the 82385, static RAM (SRAM), and associated programmable array logic (PAL)

Table 1: The VX FT Server model designations and respective base configurations.

Model	Cache memory (K bytes)	Standard RAM (megabytes)	Hard disk drive size (megabytes)	Serial channels	Maximum number of users
400/10	64	4	157	N/A	N/A
400/30	128	4	347	N/A	N/A
400/60	128	4	647	N/A	N/A
400/90	128	4	1047	N/A	N/A
800/10	64	8	157	32	64
800/30	128	8	347	32	96
800/60	128	16	647	64	128
800/90	128	16	1047	64	128

Note: N/A = Not available.

Table 2: Indexes based on BYTE benchmark results. The VX FT Server is faster than the IBM Power Platform 486 and most of the 33-MHz 80386 PCs. (Indexes for the fastest 33-MHz PCs are not shown; only preliminary tests were run.) All tests were run on beta or prototype machines; times for shipping units might vary.

	CPU	FPU	Disk I/O	Video	Word processing	Spreadsheet	Database	Scientific/Engineering	Compilers
Apricot VX FT Server	6.7	21.8	2.3	5.2	5.5	4.6	2.6	N/A	5.0
IBM Power Platform 486	5.3	21.4	1.8	4.3	N/A	N/A	N/A	N/A	N/A
ALR 33/386	6.6	11.1	2.3	1.6	N/A	N/A	N/A	N/A	N/A
Zenith Z-386/33	4.8	N/A	3.1	3.0	N/A	N/A	N/A	N/A	N/A

Note: Indexes show relative performance. For all indexes, an 8-MHz IBM PC AT = 1. N/A = Not available. For a full description of all the benchmarks, see "Introducing the New BYTE Benchmarks," June 1988 BYTE.

Photo 1: The back of the VX FT Server sports numerous I/O ports and other outlets. The rugged handles on the top of the unit make carrying the system relatively easy for two or more people.

chips. It plugs into both the 80386 and 82385 sockets in the original Qi motherboard. Eventually, a revised 80486 motherboard will replace the daughter-board arrangement, but probably not until a 33-MHz version of the 80486 becomes available.

A bank of single in-line memory modules provides main system memory. The motherboard can accommodate up to 16 megabytes of RAM using Apricot-sourced double-decker SIMMs. Using the more readily obtainable 80-nanosecond parts, the motherboard holds 8 megabytes.

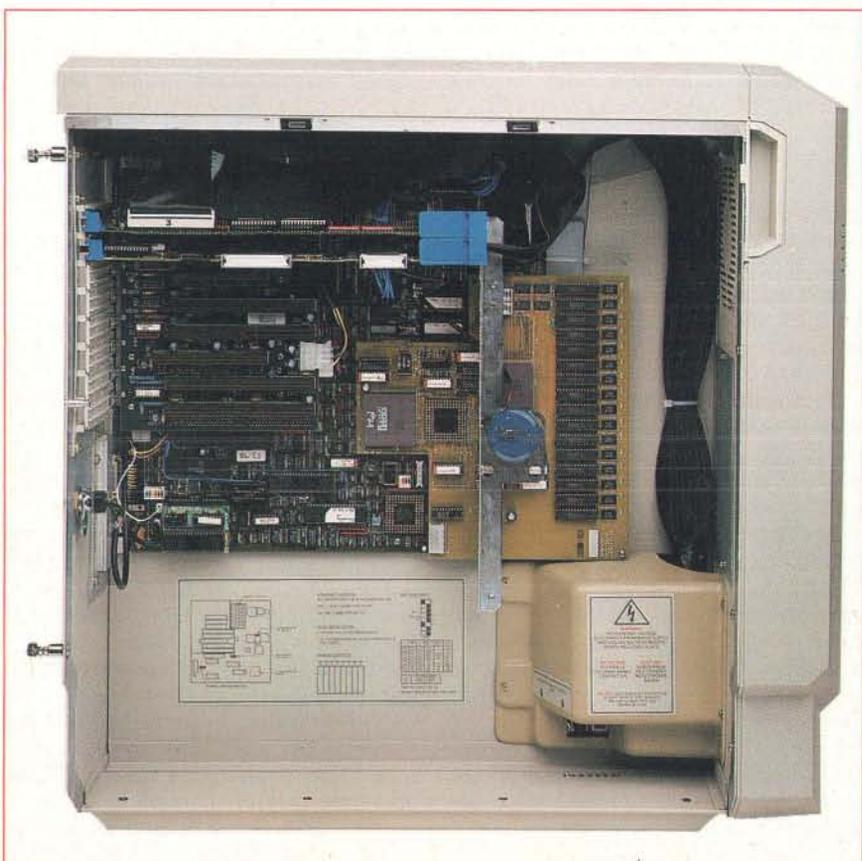
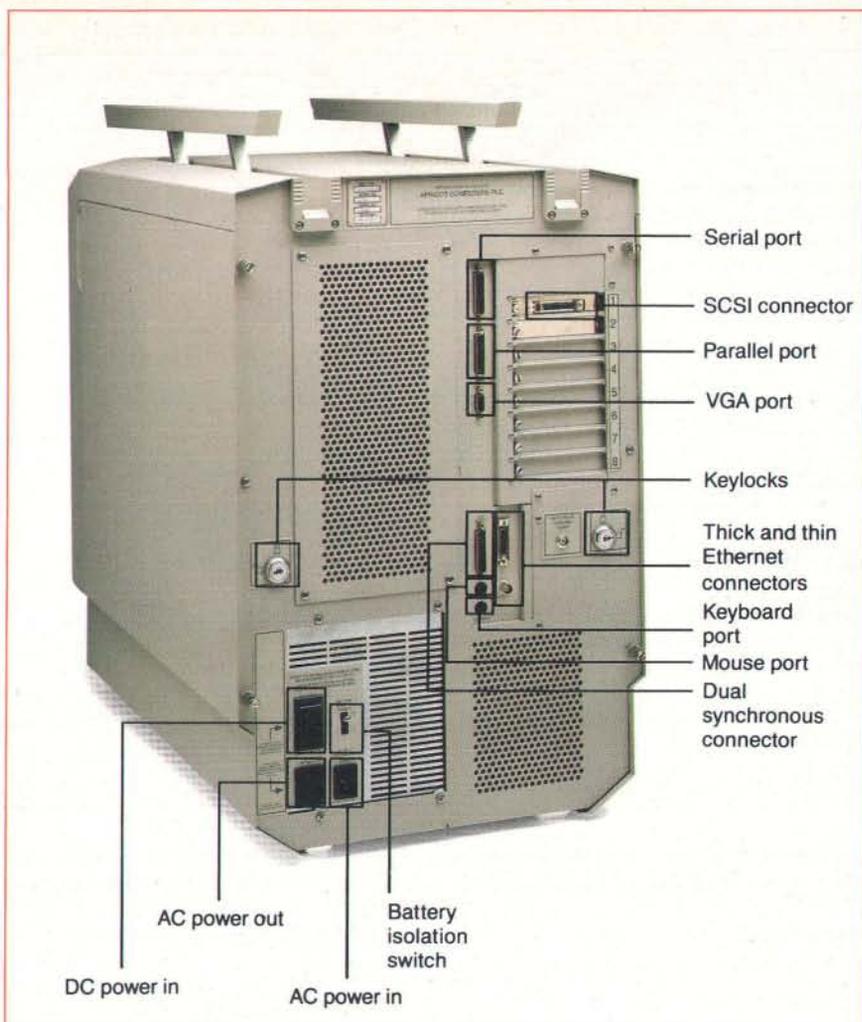
While the 80386 benefits from the 82385 cache controller and a 64K-byte bank of 35-ns SRAM, the 80486 itself has 8K bytes of four-way set-associative cache memory on-board. Apricot has added an external 128K-byte cache using 25-ns SRAM orchestrated by a 25-MHz 82385 and some custom PAL work. This arrangement has been christened Hyper-cache. The low-end versions of both series use a 64K-byte cache.

According to Apricot, Intel expected PC manufacturers to use the 80486 without any external caching, at least until both an "82485" and a 33-MHz version of the 80486 were in production. Rather than suffer the inevitable wait states or use faster, less-economical system memory, Apricot devised its own 82385 solution.

Apricot claims a 95 percent to 96 percent hit rate with its two-way set-associative cache system, depending on the code being run. The company thinks that the

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Photo 2: With only SCSI and run-length-limited disk drive controllers in two of the eight MCA slots, the inside of the VX FT Server looks empty. Note the large daughtercard on which the 80486 CPU sits. Apricot plans to integrate the CPU on the motherboard sometime in the future.



external cache is vital for multiuser performance; it unloads a good chunk of bus traffic and enables the 80486's burst mode. The BYTE benchmarks bear this out. IBM's 80486 Power Platform uses no external cache and suffers the consequences. For example, the VX FT Server was about 1.6 times faster than the IBM product on the string-move portion of the BYTE CPU tests. On the matrix, Sieve, and sort portions, there was virtually a tie. The string-move tests make extensive use of cache memory.

The 80486 has full floating-point capabilities built in. The 80486's computational abilities are alleged to exceed those of a Weitek 3167 math coprocessor while maintaining compatibility with 80287/80387 code. The BYTE FPU index supports that performance claim.

Courtesy of a plug-in bus extension, the VX FT Server has eight MCA expansion slots: four 32-bit and four 16-bit. The Chips & Technologies 452 VGA controller, a high-performance video extension, is available on one of the 16-bit slots, although it was not installed in our demonstration unit. In addition to the eight physical slots, two phantom slots let you configure the Ethernet and bisynchronous port options.

Making Your Data Secure

Given that the VX FT Server will hold a lot of valuable data, Apricot has gone to some length to provide more security than most PC-based file servers offer.

Two built-in 12-amp/hour solid electrolyte lead-acid batteries provide backup power. A lightly loaded VX FT Server could conceivably run for 1.5 to 2 hours on the batteries, but a fully configured machine, including a monitor, would get about 15 minutes—plenty of time for an orderly software-controlled shutdown. A switch on the back of the unit lets you disconnect the battery.

Temperature monitors are linked with sensors that detect electrical failure in the cooling fan. An alarm sounds if the machine runs too hot, and an automatic software-controlled shutdown occurs.

The keyed lock at the back of the system unit is only the first portion of the VX FT Server's access control. The company offers a \$450 security package called the Qi Environment. It includes a microprocessor-controlled infrared remote device and a master reference disk that guards access to all or part of the VX FT Server's services. You point the infrared card at the sensor on top of the unit, click, and then enter a code for access. Unauthorized attempts to access components or data sound an alarm that

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is specific to the offense.

The computer's security scheme is flexible enough for you to shut off the Ethernet link in the evening or on weekends but still allow system access for backup at preselected times. You can also enable or disable disk drives or any of the eight expansion slots. The security is menu-driven, and its configuration is stored on the master reference disk. If you lose or damage this master disk without having made a backup, you have to contact Apricot for a replacement. You can leave the security system inactive.

Mass Storage

As befits a well-designed file server, the VX FT Server has mass storage capacity to spare. The system box has space for six full-height devices, one of which must be fitted to provide mounting for two half-height drives. Three drives are inserted from the front, and three from the rear. Between the two stacks of drives is a plug-in partition holding two 4-inch-diameter cooling fans.

The standard VX FT Server has one 1.44-megabyte 3½-inch floppy disk drive and one of four hard disk drive options. The Series 400/10 and Series 800/10 have a 157-megabyte SCSI Maxtor drive. The other 80486-based models, the 30, 60, and 90 in each series, also use SCSI Maxtor drives run off an AHA 1640 Adaptec controller fitted into the MCA backplane. The drive capacities are 347, 647, and 1047 megabytes, respectively. Average access times are in the sub-16-millisecond range.

Apricot lacks a slick hardware-based mirroring system like that found in the DPT SmartCache controller, but the company has implemented one in software. This poor man's version of disk mirroring may be marginally slower in writes to disk, but it doesn't require the development of a special, low-volume

controller card. Although the SCSI controller can nominally have up to seven devices daisy-chained to it, Apricot suggests fitting a controller for each drive to get maximum performance.

With the potential for up to 5 gigabytes' worth of hard disk drives humming away inside the box, Apricot has not skimped on the power supply. It's a 465-watt monster with built-in surge protection.

The three tape backup options range from the ridiculous (in the server context) to the sublime. An 80-megabyte DC2000 tape streamer that runs off the floppy disk drive controller is at the leanest end of the tape options. A somewhat more useful 150-megabyte SCSI tape drive from Irwin Magnetics sits in the middle of the range. For the VX FT Server user with 1 or 2 gigabytes in the box, Apricot supplies a 1.2-gigabyte DAT/DDS (full-height) digital audio tape drive from Hewlett-Packard. No price has been set as of this writing for the DAT/DDS drive.

Microcomputer or Minicomputer?

With the 80486 VX FT Server prices starting at \$18,000, Apricot is competing with both PC-based workstations and low-end minicomputers. Considering its performance, its security features, and the number of users it can serve, the VX FT Server should be a cost-efficient alternative to those systems.

It's not perfect. The prototype unit we tested overheated easily and would not run some of our benchmark software. We expect that these problems will disappear in units with production CPUs, however.

Although the SCSI drives provide easy mass storage expandability—an important feature to consider for a growing network—some users will want hard disk drives with faster access times. Apricot should think about offering a hardware cache controller and faster ESDI drives as options.

The 80486 has popped up sooner than expected, and with it a new standard in the price/performance ratio. It is too soon to announce the death of the minicomputer again, but the power that the 80486 provides, as Apricot has demonstrated, will be giving many midsize-computer makers nightmares. The good news is all for the users. ■

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