long as you have either a serial RS-232 or 8-bit parallel port available, you can turn the system into an IEEE-488 bus controller simply by plugging in an ICS Electronics Corp's Model 4825, or 4828 Interface Card. All the commands for 488 operation are implemented onboard. Be aware though that ICS offers these cards to OEMs, and they will more than likely be somewhat above $600 in single quantities.

In operation, the card serves as a talker/listener, and your computer thinks it sees either another serial or parallel device. Consequently, writing code to service instruments is a great deal easier since no special 488 drivers are required.

Heath Systems Add-Ins. A few months ago, I happened to call Doug Sauby at Magnolia Microsystems regarding the possibility of adding more than 64K of memory to the Heath/Zenith 89 microcomputer. Doug felt it could be done by employing the memory I/O bit-mapping to gain the extra address bits.

As a result, Magnolia developed the $595 Invisible Disk. This card employs 64K × 1 dynamic RAM, and extends your total memory space to 176K. In the current implementation, 112K of the added board is treated as a very fast disk drive. About the time you read this column, Magnolia plans to have MP/M fully implemented to permit multi-user/multi-tasking operations on the machine.

Implementing the Invisible Disk is easy. All that is necessary is to remove the 89's cpu card, plug in the Magnolia bit-mapping board and the RAM card, and put it back together again. The most difficult part of the process is removing and reinserting the cpu card.

Once you have performed that task, all that is necessary is to link a software module to tell CP/M that the new device is present. You basically set the RAM up as logical device 40; and, using the configuration program, set it to the desired disk name (in our case, drive F:).

In operation, you can use setauto to run a Submit program to load the desired program into the semiconductor disk, and begin immediate operation. Ours is set as follows:

PIP F: = *.*[VO]	put contents of disk on to F:
F:	Log in F: drive
WS	run the program—in this case WordStar.

Due to the paucity of space available on Heath add-in boards, Magnolia wasn't able to implement parity checking. Instead they opted for CRC—Cyclic Redundancy Checking, careful layout of the printed circuit board, and close attention to decoupling capacitors. After about two months of operation, we haven't experienced any soft errors; and surprisingly the 89 hasn't overheated.

I do want to point out, however, that if your 89 is over two years old and you're thinking of adding such niceties as the Magnolia 8-in. controller or the Invisible RAM, chances are you will overtax the power supply. We discovered this in one of our 89s that we have had since 1980. The bridge rectifier broke down due to high current, and the secondary in the transformer burned out. Zenith has taken care of these problems in units produced in the last year. The transformer and rectifiers have higher ratings, and all the regulators have heat sinks. So before adding make sure you have adequate power.

Another enhancement for the 89 comes from DG Electronics. It offers the Super 89 for $800 for a 64K version and $1400 for a 256K configuration. The board completely replaces the Zenith cpu card, and comes with a 4-MHz cpu, real time clock, parity check on RAM, expanded bus structure, on-board serial I/O port, and is CP/M-HDOS compatible. We asked both the DG folks and the Magnolia designers if the new board would work with Magnolia's disk controllers, but as of this March neither was sure since no actual tests were run. Both design groups saw no problems since the DG board is functionally compatible with the Zenith card.

An interesting add-in that you might want to consider for your 89 comes from Artra Inc. The board, called the Housemaster, provides you with a real-time clock, voice recognition, sound synthesizers, BSR X-10 home control, battery backup for the calendar/clock, and dual RS-232 ports. The card, which is available as a kit for $299 or $399 assembled, takes the place of the I/O card. Be aware that things like the RS-232 ports and voice synthesis are options and range in price from $35 to $225 for assembled versions.

Commodore Systems Get CP/M. It seems that everyone wants to have CP/M compatibility, and Small Systems Engineering is providing it with the $895 Z-80 based Softbox. This add-on allows CP/M, RS-232 ports, and an interface to a Corvus hard-disk system, as well as 64K of RAM. The similarly priced Hardbox enhances the Pet disk operating systems allowing one to four Corvus drives to emulate the Commodore floppy-disk system for up to 64 users. It comes with seven utilities including: user reconfiguration, password security, file transfer between hard disk and floppies, diagnostics, and the ability to use a video recorder for data backup.

To speed up Commodore BASIC, SSE has PETspeed priced at $350 to give a 30% increase in compiler operation. ◇

FOR MORE INFORMATION

For more information on the products described in this article, contact the following manufacturers directly:

Applied Business Computer Co.
2883 E. La Palma Ave.
Anaheim, CA 92806
714-630-3821

Artra Inc.
Box 653
Arlington, VA 22216
703-527-0455

Burtronix
18472 Jocotal Lane
Villa Park, CA 92667
714-974-6171

Coprocessors Inc.
50 West Brokaw Road, Suite 64
San Jose, CA 95110
408-947-4616

D-G Electronic Developments Co.
700 South Armstrong
Denison, TX 75020
214-465-7805

Data Mac Computer Systems
680 Aiamanor Ave.
Sunnyvale, CA 94086
408-735-0323

GTCO Corp.
1055 First St.
Rockville, MD 20850
301-279-9550

ICS Electronics Corp.
1620 Zanker Road
San Jose, CA 95112
408-298-4844

Interface Inc.
20932 Cantara Street
Canoga Park, CA 91304
213-341-7914

International Business Machines Corp.
Information Systems Div.
Box 1328
Boca Raton, FL 33432
305-998-6007

Magnolia Microsystems Inc.
2264-15th Ave. West
Seattle, WA 98119
206-285-7266

Microsoft Consumer Products Inc.
10700 Northup Way
Bellevue, WA 98004
206-828-8080

National Technology Sales
Box 401782
Garland, TX 75040
214-349-8259

Rana Systems
20620 South Leapwood Ave.
Carson, CA 90746
213-538-2353

Small Systems Engineering Inc.
71 Park Lane
Brisbane, CA 94005
415-468-2900

Sorcim Corp.
405 Aldo Ave.
Santa Clara, CA 95050
408-727-7634

Tecmar Inc.
23600 Mercantile Rd.
Cleveland, OH 44122
216-464-7410

Vista Computer Co.
1317 East Edinger
Santa Ana, CA 92705
714-953-0523

Wesper Microsystems
3188 Pullman Street
Costa Mesa, CA 92626
714-850-1666