Build an H/Z89 "Notebook Computer" for About $200?!

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Introduction

We're all impressed with today's newest technologies. And large companies are following the new technologies' logical paths and building bigger, faster, more complex, and more expensive computers. But there is another application for some of these advances that seems to have escaped the PC generation of hardware developers.

Why not apply some of this new technology to a computer design that has been around for awhile, such as the H/Z89? You'd be surprised at how easy it is to do, and how little it costs. Less than any PC compatible notebook computer you'll find; a whole lot less. And what about software? Well, most all of us use public domain H/Z89 software, which is virtually free!

As a hardware/software design contractor (and as a member of the pre-PC generation) I have had some opportunities to do just that, build compact, low cost H/Z89s. Naturally, we do not call them H/Z89s--or even microcomputers. Instead, they are "Pocket Survey Recorders", "Price Sign Controllers", "Remote Data Loggers", and so on. But really, they are all just specialized H/Z89s built with current technology.

So, what does it cost to build a complete H/Z89 "notebook" computer using today's technology? You'll be surprised. Because, while some companies have been building ever more complex microprocessors, others have been improving and integrating the older designs, such as the Z80. The result is that it not only eliminates a lot of parts, but also makes a computer much easier to build.

Building a (Mini) Computer

First, we need a microprocessor. Zilog, the original creator of the H/Z89's Z80 CPU, are still producing ever better versions of the venerable Z80 that are 100% upward software compatible. That means that these new CMOS microprocessors can run with HDOS and CP/M operating systems and any of their original application programs without any modifications! But of course, there have been some dramatic improvements hardware wise.

The Zilog Z80180 (and Hitachi 64180) now feature 10 MHz operation, memory management for 1 megabyte of memory, 2 DMA channels, 2 programmable interval timers, and 3 serial ports

all on a single 68 pin chip. The device is CMOS and runs on roughly 1/10 the power used by the H/Z89's original Z80 CPU! Memory? Oh, that's easy...One CMOS EPROM and one CMOS static RAM and we have 128K of RAM and 64K of ROM for about $20, and the Z80180 CPU costs $7 to $30 depending on clock speed. Add about another $30 worth of parts for interface, circuit board, crystal, connectors, etc.

We now have more memory and processing power than the original H/Z89 on a single board about 5 inches square and costs about $60. Plus, it runs on about 50 milliamps--we can run it for several weeks with a few small dry cells! To complete our notebook computer, we can add an LCD display, keyboard, floppy disk drive, batteries, enclosure, and various connectors to bring the total parts cost to about $200, as seen below:

H/Z89 Notebook Computer Parts Cost Estimation

Count	Part Description	Cost
1	Z80180 CMOS Microprocessor (6 MHz)	$ 7
1	128K x 8 CMOS Static RAM	$ 15
1	64K x 8 CMOS EPROM	$ 5
1	40 Character x 2 Line LCD Display Module	$ 30
1	ASCII Membrane Switch Keyboard	$ 10
1	3.5 Inch Floppy Disk Drive	$ 50
4	Rechargeable NiCad Cells	$ 22
1	Printed Circuit Board and Enclosure	$ 30
10	Miscellaneous CMOS Support Chips	$ 10
10	Miscellaneous Connectors and Sockets	$ 10
20	Miscellaneous Discrete Components	$ 10
	Total Parts Costs	$199

How is this possible? Simple. A few CMOS chips today replace all the H/Z89's original logic boards. One compact LCD display replaces the CRT, video boards, and flyback transformer. And--since everything is now CMOS--we can replace the power supply with a few small dry cells or a rechargeable battery. So we no longer need a massive power transformer, big filter capacitors, lossy voltage regulators, or a cooling fan either.

More "H/Z89 Notebook Computer"

A 40 x 2 character LCD display is fine for many applications and it is very compact. Also, it can be programmed to emulate the H/Z89's graphics characters. If you want to run spreadsheets and word processors, full size LCD displays are available for a few hundred dollars more. These would even provide high-resolution graphics capability. For roughly an additional three hundred bucks we could bring RAM to a full megabyte, add a hard disk, and even a modem.

The Development System

Now, it takes lots of expensive equipment to develop a new computer, right? Well yes, it does, to develop a peesee compatible. But you already have the best Z80 development system money can buy right there in your H/Z89! Most of us have several '89s laying around, and HDOS, CP/M, languages, editors, debuggers, serial ports, everything's all there--except perhaps an EPROM programmer, and they don't cost much.

Applications Anyone?

Imagine how many problems you could solve with an H/Z89 that fits in your pocket and runs for weeks on batteries. There'd be no need to ever turn one off, especially if it were A-C line powered. It could even be installed in your car. The drain on your car's battery would be virtually imperceptible, about the same as your dashboard clock draws.

Chances are, you will find many applications where a complete display, keyboard, and disk drives aren't even needed. The computer can be dedicated for such applications, with a custom EPROM-resident program. Probably most of your own home appliances already have such mini-computers, such as digital microwave oven, washing machine, security system, VCR or heating/cooling thermostats. A pocket H/Z89 can do any or all of the jobs these things do, with the advantage that you can reprogram them through your pocket H/Z89's software.

Conclusion

Most of the costs to develop, build, and operate a notebook computer can be eliminated by exploiting the older-but-reliable 8-bit H/Z89 design and software rather than clinging to the peesee design. The H/Z89 design is simpler, and has been around so long that all of the needed tools are very inexpensive--if not free. Sure, the 8-bit H/Z89 design won't run Microsoft's Flight Simulator, but there are hundreds of other applications it handles just fine. And with many applications, simplicity, low operating power, and low cost are far more important than peesee compatibility anyway.

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              Your Editor's Thoughts on Clay's Article
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Emulating Heath's original design by exploiting well-developed 8-bit component technology is an impressive, and practical suggestion. For any hardware hacker, it would be essentially child's play to carry out. And there definately is a need for an inexpensive '89 'clone', because prices of desk top or pocket computers are STILL through the ceiling. Even "surplus" Zenith Data Systems' portable computers offered by "distressed merchandise" dealers such as Damark and DAK Products are way too expensive for the average wage-earner to buy. And we must admit our old "grey boxes" are a bit large to fit in one's auto--unless it's a wagon or van!

There's nothing wrong with 8-bit technology, any experienced big '89 user can tell you that. Sure, it's not peesee compatible, but most users really don't need, and usually do not use or appreciate pop-up windows, pull-down shorts or any of that other snake-oil-lubricated junk! Don't agree?! Just read the letters published in many of the "slick" computer mags (such as BYTE and REMark) from peesee-type users running only three to 4 application programs on their machines daily. They say that the fancy-schmanzy stuff takes up more memory and time than it's worth fooling with--or paying for. These discontented bigbux machine users have been and are unconciously searching for a practical and inexpensive little machine such as "Clay's Condensed Computer".

Clay tells me he has built and sold a number of dedicated Condensed Computers to mall survey takers. They're the ultimate in simplicity because they have only a few data-entry keys for the survey taker to learn how to use. They don't even have disc drives because most data consists of Y/N responses to questions the takers ask of their subjects. At the end of a shift, surveyors download the machines' memory to a large computer for analysis. Couldn't be simpler, far less clumsy than paper survey forms hurriedly filled out with leaky or dry ball-point pens, or broken pencils.

Just visualise how easy it'll be to use a pocket-size version of your old grey box on your lap in a plane or your car while traveling, or in your tent on a camping trip. Some of our nay-saying readers may complain that it's too hard to find components so won't even think of trying to make their own mini-'89. Hey, don't you read ANY hardware hacker magazines? There are countless ads listing surplus components such as TI-99A and other small keyboards, digital ICs, liquid-crystal displays of all sizes and complexity, cables, plug-in power supplies, hardware from teentsie-weeny lock-washers to huge bolts, and electronic enclosure in dozens of sizes, colours, and shapes. And most, if not all, of this stuff is priced well within reach of all but the flatest pocketbook. Now what's your excuse for not getting on Clay's mini-'89 bandwagon?

Readers, write to Clay; tell him YOUR thoughts about home-made mini-'89s--positive OR negative. He needs your input and says he'll be glad to send photo copies of developmental schematics of his machines if you're really interested. (To show good will, send him a couple 1st-class stamps or a buck or two along with your return address!) Clay's full address is on page one. Write Right Away Now, y'all hear?!

READER'S MAILBOX

Dear Lenny,

This is in answer to your wish for a disassembler. It IS possible to disassemble a compiled program, but making the resulting code readable is another story. I've already told you about why the compiled code is so large--and it's those same routines which are thrown in by the compiler that make the disassembled code almost indecipherable. Yes, I have disassembled some programs and patched them. But to do that I searched for particular sections of code and disassembled only small portions. It is not practical (if even possible) to try to restore the original program source code.

For your particular situation, search through the existing programs for the codes sequences which have to do with screen generation for the terminals they are designed to serve. Once located, you may then patch in the codes needed by the H89 (H19). In order to do proper patching, you will need to know enough about assembly language and CP/M DOS to recognize appropriate DOS calls. Disassembly can be done with DDT, or better yet, with DSD which was once available from Echelon. Perhaps Alpha Systems now has it.

Searching for code segments can be done with various file patching programs. My favorite was the ZAP program from Software Toolworks. The public-domain SuperZap program also should help in this area, and may even be easier to use. I adapted SuperZap for the H89 and included it my Z-System package as well as many of my favorites of public-domain discs.

Although ANAPRO is no longer actively advertising as a vendor in the Heath marketplace (or any other marketplace for that matter), we are still providing products. Quikdata is our only distributor for EMULATE, CPC and 4MHz mods. Prices for these products have been reduced also. You may wish to still include us in your list of vendors. That's it for now.

PETER SHKABARA, ANAPRO Corp., Box 1987, Blythe, CA 92226

PS: A listing of ANAPRO's current offerings is enclosed for your review. If you wish to take on the sale of any of these items, let me know. I am willing to send the software packages to you on consignment if you like--I would mainly like to see them go to a good home and just be compensated enough to make it worth dealing with. /s/Pete

[Yo, Pete! Thanks for the continuing info on compiled programmes! Actually, my problem is not the program as much as a particular sequential data file it produces. This file has a bug buried in it somewhere at the very top which I can't get at to eliminate with DDT, DDEU, or SZAP! In sheer desperation I've dug out all my texts and references for MBASIC programming and am trying to write a program which generates another sequential data file similar (or exactly the same) as the '.COM program does. I'm hoping that this approach will work. Then I can hand-enter all good data from the lengthy printout generated by the '.COM program. If that roundabout subterfuge works, I can then put a good data file onto my correspondant's working data disc and she'll be back in business! (Watch for the next exciting chapter in this engrossing drama in a forthcoming JOURNAL!) Your update note is at the top of page nine--hope you sell something Real Soon Now! -- ed]

Dear Sir:

Your name has been suggested as a possible source [sic] for obtaining material which would enable me to become familiar with the basics for operating a Heath H88 computer with disc drive (HDOS).

To date I have obtained two manuals: 592-2268-02 (operation) and 595-2647 (assembly), neither of which offer basic procedure for use and operation.

Information re software, manuals appreciated.

ED ARMATA, Box 184A County Road, Holyoke, MA 01040

[Ed, I tried to contact you by phone to save time, but your number's unlisted! So I hope this complimentary copy of the SEBHC JOURNAL will help you get started on obtaining the necessary materials to get you up and running! -- ed]

Dear Len,

Here's my cheque for another year of the JOURNAL. Altho I have effectively left the 8-bit community (I'm typing this on a keyboard of a 386SX), I still have some interest in what goes on in the wonderful world of the H89--a citizen of which I was for a little over ten years--having built my first kit in July, 1980.

The main reason for my letter: I now have two complete 89 systems looking for a new user. As is typical of this kind of situation, I can give the right person a rally good deal as I have lots of extra goodies in the line of software, documentation, etc., as well as two spare computers with lesser capability that could be used for parts--or upgraded to full operational status.... One of these units was actually next to the last kit shipped by Heath at the end of the line for the 89 machines when the kit price was down to $600--if I remember correctly.

Please note that I have no way of packing these items for shipment, so I must limit my market to those within reach of my home (in a northeast Philadelphia suburb). [I'm sure that at least a couple SEBHC-ers live within a 150-mile radius of your QTH, right, readers? -- ed]

I enjoyed the calandar shown on the April issue, but that illustrates one of the things that has swung me in the direction of the more powerful machines. I have a calendar program for my 386 (seen enclosed sample printout) with many features (cost $37). I just got to the point where the potential of the new [IC] chips looked so good--and the prices came into my range--that I could no longer resist. [After all, John, we're all human--I have an H121 with ZPC (peesee emulation software). Even so I use my '89 90% of the time. -- ed]

Some More "MAILBOX"

[With my new machine] even my feeble attempts at programming are more fun. Remember CRYPTO.BAS which I sent you and you were kind enough to print? I've converted it for QBASIC using the extra pizzas of colour, and it's much more impressive on the screen when the clear text and cryp text are in different colours. As an EXE file, it can run on just about anyone's peesee with no problems.

Sorry to say goodbye, but I'll be watching [the 8-bit world] for a while yet through the JOURNAL.

JOHN V WERT, 21 High Road, Levittown, PA 19056; 215-945-0397

[Shucks, John, hate to see you drop out of the '89 fun! But maybe you'll change your mind after reading our front-page article by Clay Montgomery. And Lindley Systems has a handy '89 <==> peesee conversion utility (see Vendors listing elsewhere) which might just keep your hand in the game with at least ONE of your old "grey boxes". But (sigh) your for-sale ad is in this issue; please let us know if it moves anything! The calendar example you enclosed is really spiffy; I'll show it to A Stapher and see if she can do anything nearly as good with our old '89 and Epson LQ-800. So long and Good Hacking! -- ed]

Dear Lenny,

I think you're about to get the JOURNAL caught up with the months. It has gotten gooooood! I've definately enjoyed the BASIC articles of A Stapher; the MAILBOX has been good too.

Sometimes I guess I'm just hard-headed or "can't see the forest for the trees". Perhaps Mr Stapher could give a short explanation for this [problem]. In DAYDATE.BAS, selecting choice 1 and entering the same date twice in for the first and second date prompts, the program says there is "one" day between the two dates! Howcum? Shouldn't it be "zero" days when the same date is entered for both inputs? Could it be that I've missed something totally? [If so,] what?

There is a typo in line 350, the initialising variables for "M", "D", and "Y". It won't work properly because "Y=180" should read "Y=1801". The program couldn't find the right week day until I correct that variable. Was that a typo? Or was it the challenging bug that was mentioned in the article? If it was the bug, please don't consider me for inclusion in the contest--I don't feel it would be fair.

Here's request for help by some JOURNAL reader who knows of a modem program which might help me out. I need one which runs on an H/Z89 under CP/M, has full duplex and split-screen capabilities. Also it'd be nice to be able to switch incoming ASCII information to either printer or disc. The program doesn't have to be elaborate, but split-screen capability is a must.

I shall be most grateful if any of the JOURNAL readers can point me to such a program!

ALLIE C LINGO, P O Box 118, Dierks, AR 71833-0118

[Hey, Allie! Hope you're not put out by our not putting your letter in last month's issue....we were unavoidably delayed, again! Thanks for pointing out the typo--Ms Stapher was in a bit of a hurry and I didn't proof-read the printout; we both goofed! Your query about the "one" day could be a toughie, but remember, "one day" is 23 hours, 59 minutes & 59 seconds long, so maybe that's why the program said that....Incidentally, A Stapher's on vacation so "Writing BASICally" is off until next issue, too. If we have space left in this edition we'll try to squeeze your TEMPCONV.BAS listing in, but if you don't see it, we'll try again next month! -- ed]

Dear Len,

I realise my subscription has expired and my H8 system doesn't get much work these days since I bought a Zenith 159 for the family last year. I used it on the ship for a lot until I got a Zenith 120. I'm convinced that Zenith's products are better than most [others]. Anyway, in case there's anybody who can put my old H8 to use, I'd like to offer it for sale through the JOURNAL: It has a Z80 CPU, modified to run at 2 & 3 MHz [clock], H17 & H37 controller, 4-port serial board, 64k dynamic RAM and extended configuration option. It includes an H19 terminal with superclock, CP/M, HDOS, BASIC interpreter and compiler, COBOL-80, SUPERCALC, PEARL-III, MICROSTAT, dBASE-II, WordStar 4.0 (CP/M version!), and numerous other software. All manuals included, but disc drives and enclosure are NOT! Otherwise in FULL WORKING ORDER. $525 includes ground shipment within 48 states.

I also have some other H8 stuff: 8080 CPU modified w/Z80 and PAM-37 ROM, $75; D-G 64D memory board, $40; H17 hard-sector controller, $15; full-height DSDD floppy drive, $25; H8 chassis w/gold-pin motherboard and front panel, $30. Everything is in working order. If anyone is interested in any of these items or the H8 computer system, please contact me by mail or phone at my address below.

Thanks for publishing this; it's been a pleasure being a SEBHC member over the past four years....

GARY S MELANDER, 460 Garrison Place, Virginia Beach, VA 23452 phone 804-498-9850

[Oy! Gary, we don't like to see you vanish over the horizon! Not having heard from you For Quite A While, we thought you'd ended up somewhere in the Persian Gulf on "temporary duty"... But we do hope you'll move your H8 and spares, Real Soon Now. Please do keep in touch--drop us a line now & then, perhaps a yarn about how you and your H8 made out at sea, even? The H8 takes up a lot of desk space, unless you have a telephone relay rack available to stack its' components inside. When we get a little spare time we shall be trying to stuff most of our H8 system into a surplus rack we aquired many moons ago. Meanwhile, keep the faith, baby! -- ed]

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ANOTHER LOOK AT MAKEBIOS

by
Tom Rittenhouse, Correspondent at Large
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MAKEBIOS seems to be a difficult program for many H/Z89/90 users to get to work properly. The first problem is that the program MAKEBIOS.SUB on the CP/M 2.2.04 distribution disc won't work with single-sided single-density 5.25-inch drives. There was an original manual insert with a newer version of MAKEBIOS.SUB, but just in case you lost your copy, we're re-producing it here:

```
$2:MAEBIOS $2:1 $1
ASM BIOS.$2$1Z
REN $1:BIOS.HX0=BIOS.HEX .....(That's HX-ZERO, not OH!)
$2:MAKEBIOS $2:2 $1:
ASM BIOS.$2$1Z
REN $1:BIOS HX1=BIOS.HEX
$2:PREL $1:BIOS $1
$2:MAEKBIOS $1:3 $1:
```

You must enter this exactly as shown here; the spaces are important. You may use ED, the CP/M line editor, a text processor such as TXTPRO (available from the SEBHC JOURNAL), or a word processor such as Word Star. If you use a word processor, you'll need to save your file in ASCII mode. Whichever method you use, save the listing as MAKEBIOS.SUB.

You'll need three drives, or you'll have to spend a lot of time swapping discs. You must have copies of your CP/M distribution discs I & II, and a blank formatted disc for MAKE-BIOS to record the finished BIOS.SYS onto.

First we'll use the methods described on the aforemention-ed manual insert sheet:

Using three drives, put disc I in drive A:, disc III in B: and the blank disc in drive C:. Type SUBMIT MAKEBIOS C B (be sure to include the blanks shown here). In a couple minutes, a listing of the eight possible BIOSes will appear on screen. Select the one you want. Then, while the computer is doing the work for you, go have a cuppa coffee--or whatever. When you return. you should find the new BIOS.SYS on the disc in drive C:.

With only one drive, type the same command (MAKEBIOS C B), then stay there and swap discs as the computer orders you to to so do. The results will be the same as with three drives. These are the two options which were described on the insert sheet mentioned earlier.

Now, with the soft-sector controller or eight-inch drives you can use the MAKEBIOS.SUB from Distribution Disc III following this procedure:

First, format two double (D) or extended (E, CP/M 2.2.03 only) density discs and SYSGEN one as a bootable disc. If you have two drives, PIP the files from distribution discs I and III to this bootable disc.

With only one drive copy ASM.COM, BIOS.ASM, MAKEBIOS.COM, MAKEBIOS.SUB, PREL.COM and SUBMIT.COM to the bootable disc

from the appropriate distribution discs. With only these files on a double or extended-densitiy disc there should be plenty of room, even on a single-sided forty-track drive, for MAKEBIOS to operate. To make sure, check the disc with STAT; if there's forty two k-bytes of R/W space on the disc you're OK.

If you have two drives, put the system disc in drive A:, and the blank formatted disc in drive B:. Type SUBMIT MAKE-BIOS B: A:. (Note the difference between this older and the new MAKEBIOS.SUB. With the older version you put colons (:) in the arguments, but don't with the new version.) After entering your response to which BIOS you want, go get a cup of whatever; when you return you'll have the new BIOS.SYS on the B: drive.

If you have only one drive, put the new abbreviated system disc in it. Type SUBMIT MAKEBIOS A: A:. After responding to the BIOS menu choices, go get a glass of water; (us guys with only one drive shouldn't be waiting our money on whatever un-til we've gotten the second drive). When you return there'll be a new BIOS.SYS on the system disc. This BIOS.SYS is writ-ten over the original one, so your system disc will no longer be bootable because the BIOS won't match the disc's system information. Use your copy of distribution disc I and PIP the new BIOS.SYS onto the blank, formatted disc.

IMPORTANT NOTE: The last step above is vital; you'll get nothing but system crashes if you have an incompatible BIOS loader on the [system] disc!

Now we're back to both MAKEBIOS.SUB versions, and one, two and three-drive systems. Put a bootable disc with MOVCPM.COM and SYSGEN.COM on it in drive A:. If you have more than one drive put the un-SYSGENed disc with the new BIOS in drive B:. If you have just one drive, you'll be prompted to swap these two discs.

Type MPVCPM37 * B:. The B: is important--it tells MOVCPM-37 to use the new BIOS.SYS on that disc instead of the old one still in memory. The asterisk (*) tells MOVCPM37 to make a BIOS sized to your system's memory; if you want a copy which will boot on any size system, replace the asterisk with 32--the minimum size system which CP/M 2.2.04 will boot on. If you're using only one drive, you'll be prompted to swap discs.

When the prompt: READY FOR "SYSGEN" OR "SAVE 38 CPM37.COM" appears, type SYSGEN.

To the prompt: "SOURCE DRIVE NAME (OR RETURN TO SKIP):", hit RETURN key.

To "DESTINATION DRIVE NAME (OR RETURN TO REBOOT):", answer with a B. Then follow the rest of the prompts. This will write a BIOS loader on the disc using the new BIOS.

It's interesting to examine how MAKEBIOS works. Doing so will also give you a pretty good understanding of how to use SUBMIT and ASM. Let's take a look at the version we reproduced earlier.

Typing SUBMIT MAKEBIOS C B tells the computer to call up a program called SUBMIT.COM. The next word--MAKEBIOS--tells SUBMIT to call up the MAKEBIOS.SUB listing. Letters C and B

"MAKEBIOS" end

are the command arguments for SUBMIT. Whenever there is a $1 in the .SUB listing, it's replaced by the first argument (in this case C), the $2 is replaced by the second argument (B). If you are using SUBMIT for something other than MAKEBIOS the arguments could be program names or some other information you need to transmit to SUBMIT. Now back to our story.

On the first line of MAKEBIOS.SUB you see $2:MAKEBIOS $2:1 $1:. SUBMIT understands this as B:MAKEBIOS B:1 C: (the B: C: of course being drive designations). The "1" which didn't change is telling the computer to run the first part of MAKE-BIOS.COM's three parts.

The second line, ASM.$2#1Z, is translated by SUBMIT.COM as "ASM BIOS.BCZ". "ASM" tells the computer to run the assembler, ASM.COM. "BIOS" tells the assembler the name of the listing to assemble, BIOS.ASM. ".BCZ" tells ASM.COM the .ASM listing file is on drive B:, to write the output .HEX file to drive C:, and "Z" tells it not to write an assembled .PRN output listing file.

"REN" in the third line changes the .ASM output name from BIOS.HEX to BIOS.HX0 (hxZERO) for subsequent use by PREL.COM.

The next three lines (4, 5, and 6) repeat the process with the second section of the assembly listing, but this time the output file is renamed BIOS.HX1 (to avoid erasing the first .HEX file).

In the seventh line, $2:PREL $1:BIOS $1 is translated to B:PREL C:BIOS C:. This calls up the simplified linking loader, PREL.COM, and tells it to take the two relocatable hex files, BIOS.HX0 and BIOS.HX1 on drive C: and combine them into one binary file named BIOS.COM, also on drive C:. Now you have three more files than you started with: the hex files, BIOS.HX0, BIOS.HX1, and the binary file BIOS.COM. This is why you needed all that extra disc space.

The last line of MAKEBIOS.SUB calls MAKEBIOS.COM's third part which erases the two hex files and renames BIOS.COM to BIOS.SYS.

I hope this clarifies MAKEBIOS's muddy waters somewhat....

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[Thanks, Tom, for this straight-forward explanation of how MAKEBIOS does it! We've seen other articles about MAKEBIOS, but your's is the best--and clearest--thus far! We hope our subscribers who are intimidated by CP/M will now take heart and try their hands, with your article as their guide. Also, Tom, we've sent you some 5.25" disc mailers--hope you'll be able to use 'em Real Soon Now! -- ed]

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THE EDITOR ASKS YOUR INDULGENCE!
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Our Editorial Assistant, A Stapher, is on vacation until mid-June. We're trying our best to get this edition out in May, but if we don't make it, we hope you will understand and bear with us. Also, WRITING BASICally is not appearing in this edition for the same reason. This month's weather has contributed anything but peace of mind--the heat causes excessive air-conditioning loads (and brownouts) and electrical storms flicking power on and off as if there was a Christmas tree light blinker in the circuits. We've re-typed several pages more times than you'd expect, but so far we've been in luck, no spoiled disc files (keep yer legs crossed, baby), yet! In The Near Future--Really Soon Now--we hope to build or buy a battery-backed up uninterruptable power supply. Maube then we can save everything to disc before the battery dies. <Sigh!> That hardware will cost a bundle, as we need at least five hundred watts for 30 minutes if the printer is chuffing along. Perhaps Your Editor should consider hiring on part-time at a Wendy's or McDonald's? (No, that'd cut into his now-limited time & energy too much.) All practical and PRACTICABLE suggestions (contribution$?) shall be most gratefully received and considered!

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EIGHT-BIT STUFF SALES

ANAPRO Update May 1991

ANAPRO presently is operating from the residence with no set hours. Usually someone will answer the phone, but there's an answering machine online when we're out.

CONNECTORS -- We have hundreds of coin-cell holders available at $1/ea., also a sizeable quantity of 10 & 25-pin connectors used on H89 controller & I/O cards or our TIM2 clock @ $2/set or $15/ten sets.

REP3 -- Sold out, but instructions and parts, p-c board lay-out, $15/set.   Sorry, no p-c boards left. Parts available separately: Connector $8; I-C pkg, diodes, resistors, capacitor, $3/set. Instructions, p-c board layout, $5/set.

ANAPRO H89 4MHz mod, only $25; blank circuit boards $4/ea.

EMULATE for H37, CDR or Magnolia now only $30.

MISCELLANEOUS ITEMS
* Software *

CP/M Perfect Writer Word Processor (8-inch format), $19.
HEATH original CP/M operating system, $15.
WordStar 4.0 for CP/M, opened copy, $39.

* Firmware/Hardware *

Super19 terminal ROM, $10.
Used 8-inch Siemens SSDD drive w/cabinet & power supply, $120

$5 $5 $5 $5 $5 $5 $5 $5 $5 $5 $5 $5 $5
   >> any of these sofware titles only $5 each <<
        QUANTITIES ARE VERY LIMITED!
Sunflower Software:

DISC SORT -- HDOS	list $29.95, now $5!	
(sorting program)		
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HUG Watzman ROM Source code for H19	list $19.95, now $5!	
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        Note: All on Heath hardsector except ZDUMP
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	Avail Qty
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SIEMENS FDD 100-5 (25ms)	7
SIEMENS FDD 211-5 (6ms)	14
TEAC 50 A (25ms)	7
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SIEMENS FDD 221-5	8
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TANDON 50, 55, 65	30
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CDC 9426	18
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* REMEX 2/3-HEIGHT DRIVE	13
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NOTE: Some of these floppy drives have doors or other parts missing, but most are complete. This list represents about half our floppy inventory. More drives are available--call for specific brand availability. If interested in all or part of the above drives, or if you have any other questions, please call Mike Morris at 313-663-3646 during business hours, M-F, 9am-5pm, Eastern Time. Also further note that we service all makes of 5.25-inch and 3.5-inch floppy drives at more than reasonable prices (fast turnaround assured). And please DO mention that you saw this listing in the SEBHC JOURNAL. Thanks!

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Keep your SEBHC JOURNAL subscription alive and well--where ever you are. Send us your new address and telephone number BEFORE you re-locate! We don't want to lose you; you don't want to lose us (and the money you've invested), do you?!

VENDORS, SOURCES & an MBASIC listing

==> EIGHT-BIT SOURCES, SERVICES, and VENDORs DIRECTORY <==
[We're slaving to keep this list accurate & up-to-date!]

CDR SYSTEMS, Inc., 7171 Ronson Road, San Diego, CA 92111; ph: 619-560-1272, 9a-5p Pacific Time Zone--ask for Herman. 8-bit machine memory devices, software, etc.

D-G ELECTRONIC DEVELOPMENTS Co., 700 S Armstrong, Denison TX 75020; phone 214-465-7805 (Central Time Zone)
8-bit "Heartbeat" computer, 8-bit "Super89" CPU upgrade/replacement board. Bruce Denton, president; Service & advice available, also some H8 and H/Z89 hardware at clearance prices; contact Bruce for details. A Certified GOOD GUY.

DISK MOVERS, 8534 McCormick Blvd, Skokie, IL 60076; phone 708-679-3727 (Central Time Zone)--ask for Miriam. HARD-SECTOR and soft-sector discs for H/Z8s, '89s in bulk quantities at very low prices! VERY NICE and HELP-FUL PEOPLE. (Do give them a call and mention us!)

HOYLE & HOYLE SOFTWARE, 111 Sparrow Drive, Isle of Palms, SC 29451; 803-886-5802--ask for Hughes. "QUERY-III, a data base for the unskilled!" HDOS, CP/M, ZDOS, MS-DOS & peesee-DOS machines run it. Doc Hoyle's A GOOD GUY!

MAGNOLIA MICROSYSTEMS, 2818 Thorndyke Avenue West, Seattle, WA 98199; phone 206-285-7266 (Pacific Time Zone)
Special memory upgrades and op-systems for H/Z89, 90s

MICRO COMPUTER REPAIR SERVICE, 1517 S State St, Ann Arbor, MI 48104, 313-663-3646 (Eastern Time Zone) DISC DRIVE REPAIR & SALES. Tell Mike Morris Lenny sent ya! SUPER GUY!

MICRONICS TECHNOLOGY, Suite 159, 54 Dalrada Road, Montgomery, AL 36109; phone 205-244-1597 voice, 205-244-0192 bbs, (Central Time Zone). Darrell C Pelan, president. Software, hardware--especially hard drives for '89s. Catalogue & 8-bit help available. A REALLY GOOD GUY!

New Orleans Data General Services, 7230 Chadbourne Drive, New Orleans, LA 70126; phone 504-241-9388--"Dave". Colour and sound boards for H8, H89. Out of business, but willing to provide tech advice on their products. Dave's ANOTHER GOOD GUY!

QUIKDATA COMPUTER SERVICES, Inc., 2618 Penn Circle, Sheboygan WI 53081; phone 414-452-4172--Henry Fale (Fah-lay) Prop. Mfgr, sales, service, 8-bit machine support & parts; publishes H-SCOOP Heath/Zenith user's newsletter, 24-hour H/Z user BBS. Ever busy but "A REAL GOOD GUY!"

SIGMASOFT & SYSTEMS, 2433 Winterstone Drive, Dallas TX 75023-7818; 214-596-0116 (Central Time Zone)--Clay Montgomery--hardware/peripherals mfgr, software publisher, hardware & tech support, RAM drives, Hi-Res grafix addons for H/Z89s. Catalog & help; "A FANTASTIC GOOD GUY!"

SKYCASTLE COMPUTER PRODUCTS, Box 1412, San Carlos, CA 94070; 415-254-3931 after 6pm Pacific Coast time--ask for Mike. Calligraphy-II and other FANTASTIC dot-matrix graphic printer software products. A REALLY, SUPER-GOOD GUY!

TMSI/LEE HART, 323 West 19th Street, Holland, MI 49423 "Inovative Products for the H/Z89"
Misc. 8-bit hardware items, hardware/software support of '89/90s. "A NICE GUY and TOP-NOTCH ENGINEER!"

==> MBASIC PROGRAM LISTING <==

```
5 REM    By Allie Lingo - Dierks, AR  05-14-85
10 REM         TEMPCONV.BAS          H/Z89 (HDOS) MBASIC
20 REM  FAHRENHEIT/CELCIUS CONVERSION
30 E$=CHR$(27):CLS$=E$+"E":BEEP$=CHR$(7)
40 T$="FAHRENHEIT/CELSIUS - CELSIUS/FAHRENHEIT CONVERSION";@
 "PROGRAM"
50 T1$="This program converts Fahrenheit to Celcius or";@
 " Celsius to Fahrenheit"
60 T2$="SELECTION MENU"
70 D$=STRING$(80,"-")
80 PRINT CLS$:PRINT:PRINT
90 PRINT TAB(40-LEN(T$)/2)T$
100 PRINT TAB(40-LEN(D$)/2)D$
110 PRINT TAB(40-LEN(T1$)/2)T1$
120 PRINT:PRINT
130 PRINT TAB(40-LEN(T2$)/2)T2$
140 PRINT
150 PRINT TAB(25)"1. Convert Fahrenheit to Celcius"
160 PRINT TAB(25)"2. Convert Celcius to Fahrenheit"
170 PRINT TAB(25)"3. Exit Program"
180 PRINT:INPUT"Enter your choice (1-3): ",X:PRINT
190 IF X <= 0 OR X > 3 THEN GOTO 500
200 ON X GOTO 300,400,220
210 PRINT:INPUT"Press RETURN to go to menu ",X:PRINT CLS$:@
 GOTO 130
220 PRINT CLS$:PRINT TAB(35)"** FINI **"
230 END
300 PRINT CLS$:PRINT:PRINT:@
 PRINT TAB(28)"** FAHRENHEIT TO CELCIUS **"
310 PRINT:@
 INPUT"Enter temperature in Fahrenheit to convert ",F
320 C=(F-32)*(5/9)
330 PRINT:PRINT TAB(5);F;"DEGREES FAHRENHEIT =";C;"DEGREES "@
 "CELCIUS"
340 GOTO 210
400 PRINT CLS$:PRINT:PRINT:@
 PRINT TAB(28)"** CELSIUS TO FAHRENHEIT **"
410 PRINT CLS$:@
 INPUT"Enter temperature in Celcius you wish to convert ",C
420 F=(*9/5)+32
430 PRINT:PRINT TAB(5);C;"DEGREES CELSUS =";F;@
 "DEGREES FAHRENHEIT"
440 GOTO 210
500 PRINT CLS$:PRINT BEEP$:PRINT:PRINT:@
 PRINT TAB(30)"INVALID ENTRY"
510 FOR P=1 TO 1000
520 NEXT P
530 PRINT CLS$:GOTO 130
```

[By golly, Allie, we squeezed it in! This is an excellent example of tight modular programming. It'll also run under Benton Harbor basic if the clear-screen and bell commands are changed to C1$=E$+"E" and B1$=CHR$(7) (in lines 30, 80, 300, 400, 500, and 530). Thanks for A GOOD Working Program! - ed]

The JOURNAL's CATALOGUE PAGE

Discontinued ("Vintage") H/Z Eight-bit CP/M software in Original Factory-Sealed Packages. Warranties WILL BE HONORED by Heath. All "Demo" software runs EXACTLY AS WARRANTIED PACKAGES DO, but updates aren't available (usually won't matter). Continuing Education (EC) packages are complete w/lectures on cassettes & final (college-acceptable credits) examination.

Item	H/Z cat #	Description	Price
SJ-XTRA		CP/M-80 for WH47--reformattted to either hard or soft sector 5.25" discs, $8 (please specify).....	$12.95
SJ-1	EC-1101	Programming in FORTRAN	* 19.95
SJ-2	173-57-1	MICROSOFT FORTRAN v3.4 (demo)	* 19.95
SJ-3	173-66-1	Programming in COBOL	* 9.95
SJ-4	173-58-1	COBOL-80 v4.0 Demo w/documents	* 9.95
SJ-5	EC-1110	Programming in Microsoft BASIC	* 19.95
SJ-6	HMS 837-1	CP/M MBASIC-80 softsector (wty)	* 19.95
SJ-7	HMS 817-1	CP/M MBASIC-80, hardsector "	* 19.95
SJ-8	173-56-1	MBASIC-80 (CP/M) demo w/manual	* 9.95
SJ-12	173-60-1	Softstuff CPS modem pgm (demo)	2.95
SJ-13	173-67-1	"Micropro" SUPERSORT for Wordstar	7.95
SJ-14	173-91-1	M-Pro MAIL MERGE w/warranty	7.95
SJ-15	HDR-837-3	M-Pro DESPOOLER w/warranty	7.95
SJ-16	173-201-1	MICROSTAT database wty, manual	29.95
SJ-22	173-61-1	SOFSTUFF GENRAL LEDGER pgm	7.95
SJ-23	173-62-1	SOFTSTUFF INVENTORY pgm	7.95
SJ-24	173-70-1	DATASTAR (w/warranty)	7.95

1 - Prices include shipping inside continental U.S.A. only except SJ-12 modem (add 50 cents for postage).

2 - All "Demo" software packages work EXACTLY as warrantied versions except manual pages are red over-stamped. (They're easy to read through a red cellophane overlay.)

3 - Some CP/M programs may not work on non-Heath machines, but usually can be patched with DDT (or equal) & run ok. ALL will run on H/Z-100 series machines on 8-bit side.

4 - On request we'll convert between hard- and soft-sector formats, between H/Z 5.25" and 8" formats (KAYPRO or Magnolia ss,sd 5.25" discs on special order) at $5 each 5.25" target disc. Original distribution disc(s) will be included with converted discs.

5 - These are CLOSE-OUT PRICES; once gone, that's all folks!

Contact Gus Bakalis at D:KUG.DOC, 313-755-2060, or L Geisler at SEBHC JOURNAL, 313-662-0750 if you need more information. Note: Profits from any software sales made thru D:KUG.DOC go toward D:KUG.DOC's operating expenses.

NOTE: "*" means 10% off both packages if ordered as a pair w/matching course--example: MBASIC & Programming in MBASIC, COBOL & Programming in COBOL, etc.

(Most CP/M-80 runs on H/Z100-series machines under CP/M-85, 6)

+++
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"Reader's MAILBOX" Enquirer HELP

A subscriber wrote us in our last edition requesting information about a problem he was having with a REMark program in their June, 1985 issue.

We were extremely busy when we copied the request into Readers MAILBOX, Then we got time, dug out the original article, checked and ran the program listings. Our enquirer was correct--THEY WERE FULL OF BUGS! We then found the article's corrections in the June, '86 "Bugging HUG"! They are:

CALYPSO.BAS: Line 10300 ends with a semicolon (;) to correct printout

CRG.BAS: Line 10130... +CHR$(11)+CHR$(28)+... should read... +CHR$(11)+ CHR$(12)+CHR$(28)+...

Ln 10300 reads... LD-FNUA!(... should read... LD=FNUA!(...

Ln 10540 reads... :LF$(HB)-LI$+LE$... should read... :LF$(HB)=LI$+LE$...

Ln 10640 reads... V$=V$+,MID$(... should read... V$=V$+MID$(...

Ln 10830 reads... FNAB$(11,20);'LINE REFE... should read... FNAB$(11,20); "LINE REFE...

PC.BAS: Line 10080 reads... CHR$(NE!-INT(NE!/256)+CHR$(... should read... CHR$(NE!-INT(NE!/256)*S56)CHR$(...

Ln 10140 reads... :CE$=:.1234... should read :CE$=".2134...

Ln 10570 reads... ;FJUA!(LC$) should read... ;FNUA!(LC$)...

Ln 10610 reads... ;MID$(BE#,LB+1) should read... MID$(BE$,LB+1)

Ln 10970 reads... PA-1,1=":<LINE FEED><TAB>"THEN.. should read... PA-1,1) "THEN...

Ln 11080 reads... :BF$"":RETURN should read... BF$="":RETURN

MBASIC's program space changes with /F switch changing number of files and the /S switch also confuses MBASIC when trying to load saved files. If at all possible, find and read the above-referenced letter in REMark. -- ed

===

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