

TEXAS INSTRUMENTS

TI Forum

by Ron Albright and Jonathan Zittrain

Chicago's Fourth

As I am writing this January column, I am getting ready to leave for the 4th Annual Chicago TI Fair (scheduled for November 1). I am really looking forward to attending the "granddaddy" of the TI gatherings. Myarc and the new Ge'neve computer will be there (and, who knows, you may be able to even buy one by then), RYTE Data (210 Mountain Street, Haliburton, Ontario, Canada K0M 1S0) will be there showing some new things (both from Germany's Mechatronics and stateside), and, hopefully, Miller's Graphics (1475 W. Cypress Avenue, San Dimas, California 91773) will be there with more details of their planned MS-DOS hardware for the 99/4A. I'll surely have enough to keep this column going for months.

You Asked For It!

So many people have written and asked for a "Best Of" the TI Forum book, that I have decided to go them one better. I am editing, collecting, and reproducing an anthology of the outstanding works of the TI community—from you, the users of the 99/4A. The *Orphan's Survival Handbook* will be over 200 pages of the best tips, programs, schematics, hacks, tutorials, lists of BBSs, user groups, TI software and hardware producers gleaned from both the electronic (CompuServe's) and the printed (*Computer Shopper's*) TI Forum, User Group newsletters (where the vast majority of the experts write and contribute, unselfishly, each month), and even more. New material written just for this book by some of the brightest minds in the TI community have agreed to share some of their thoughts with the readers of this book. It is being produced by Disk Only Software (P.O. Box 4170, Rockville, Maryland 20850; (301) 369-1339) and is tentatively priced at \$16.95, including postage and handling. It should be informative for folks at all levels of expertise. Write DOS for details. End of commercial.

Since this column has about a three month lead time, I will not be able to announce the winners of the 1st Annual TI Forum Programming Contest

until the March issue. But, right now, I can say the response has been terrific. Thanks for the support and the proof that the TI users are still alive and healthy. Also, remember, the deadline is not til December 31, so, depending on how early this issue comes out in December, you still have some time to work with.

Around TI Land

Quick tour around the industry: Myarc (241 Madisonville Road, Basking Ridge, NJ 07920) has announced the availability of a new EPROM for the Foundation 128K memory expansion card (Foundation went out of business months ago) that will allow the card to run the new Myarc Extended BASIC II software. You can get the EPROM for \$10 with the purchase of the new XB. Speaking of EPROMS, Miller's Graphics is offering one to plug into the Corcomp disk controller card that enhances its capabilities and fixes a few bugs. Also, if you have a Gram Kracker (my 1986 "Hardware Product of the Year"), you'll want to get Danny Michael's exciting accessory disk. Danny has added new commands to Extended BASIC (saved to disk, of course, with Gram Kracker) that are simply amazing. For example, "MOVE" will move lines within a program, "COPY" will copy program lines to another location and preserve the copied lines, "DELETE" will delete specified lines within a program, and more. Editor Assembler is, likewise, enhanced. This is a remarkable piece of code. If you have a Gram Kracker, buy this. If you don't have a Gram Kracker, buy one, then buy this disk. Richard Mitchell at Bytemaster (171 Mustang Street, Sulphur, Louisiana 70663) continues to do an excellent job perpetuating the legend of the *Smart Programmer*, started by Craig Miller. Richard produces a beauty of a 16-page newsletter monthly; full of upper-level programming/technical information. At \$18/year, its a bargain. I seem to have gotten the address wrong for sending for Barry Traver's terrific "magazine on disk," *Traveler's Diskazine*. It should be 835 Green Valley Drive, Philadelphia, PA 19128; \$30/year—6 issues on a disk. You have heard me review and hype Fairware software offer-

ings in this space for some months. Though I wish I could, I can't mention them at all. Well, you can find out just what IS out there by sending \$1.00 to Micropendium (P.O. Box 1343, Round Rock, Texas 78680) and they will send you a complete verified list that is 10 pages long and packed with software offerings. Just another very nice service from Micropendium to the TI community.

I just got off the phone with Miller's Graphics. They are still (understandably) mute about the hardware they mentioned cryptically at the Seattle TI Fair. It will be a device that will allow MS-DOS compatibility for the TI-99/4A. It will be produced by MG in association with a "larger firm." I did manage to get a price estimate from the folks at MG: "cheaper than an IBM-clone" was all they would say. That places it in the \$400-\$700 range. What are my guesses? Though unconfirmed by MG, I suspect the device will be an expansion case that will not only have the 8088-based operating system for the TI as well as allow almost full hardware compatibility as well. That is right—imagine plugging a modem card or a Hercules Graphics Card into your TI! Watch for more information soon and keep in touch with MG for their early information. Thus, there appears to be a brewing "split" in the TI community. Those who want to continue to upgrade along the 9900 chip capabilities will be interested in the Ge'neve from Myarc; those wanting the fabled MS-DOS capabilities will be anxiously awaiting the MG expansion box. In any case, it is a pleasant state of affairs when there appears to be two upgrade paths for the deserving TI orphans.

As promised, Listing 1 is a lengthy bit of c99 code which is a complete "game" (and I use the term quite loosely) called "CINVADERS" (get it? C Invaders?). It is more of a learning example than something that will keep your 6-year old glued to the computer. It showed me and, hopefully, you as well, how fast code written in c99 can execute. It requires version 2.0 of the c99 from Clint Pulley (see previous issues for how and where to order) and also the sound library routines which are included on the latest disk. Though the sound is superfluous and can

easily be left out if you don't have that library, they add to the game. In the issues to come, I will go through the code, subroutine by subroutine and explain how it was put together. The code is intentionally modular (as encouraged by c99 syntax), and will be easy to go through in a serial fashion. So, we'll do that in the succeeding issues. For now, type it in, look it over, and send in your questions about it.

I have some more goodies I can send to anyone who writes and asks for them. You must, however, send a self-addressed, stamped envelope if you expect a reply. If you have written in the past and did not receive a reply, you can probably now guess why. Those that send postage will always get a reply. Check out the *Orphan's Survival Handbook*. I am quite proud of it. And so should you!

We've Had It All Along!

With all the speculation and possibilities that come with the new 99/4A-compatible computers on the way, we may have overlooked a 99/4A-compatible computer that's been around for several years.

How much would you be willing to pay for a computer that performs most functions over twice as quickly as the TI-99/4A? That has a built-in RF modulator, a version of TI BASIC, and a compact, modern design?

Of course, there are a few drawbacks. This particular computer has only 2K of RAM to begin with, no sound, color, or joystick capability, and no lowercase.

Unfortunately, the computer was never really available. Its price tag, "somewhere under \$100," was reasonable, but the VIC-20 and the TI-99/4A itself drove it out of the market.

The TI-99/2 was a valiant effort by Texas Instruments to bolster the TI-99 family, but it just didn't make it. Expectations were high—an article by Harry Littlejohn and Mack Jander, two 99/2 developers, appeared in the June 1983 issue of *Byte* signalling just how far the 99/2 had come.

"The TI-99/2 was developed to compete directly with such low-cost computers as the Sinclair ZX81 and the Timex/Sinclair 1000," they said. I had an opportunity to use a prototype 99/2 recently, and I was pleasantly surprised.

Although there is a Mylar membrane keyboard underneath, the keys could actually be pressed and responded nicely. Benchmark tests showed that the 99/2 far surpassed the 99/4A in speed, with equal precision.

Because of the internal structure, the computing speed of the 99/2 was a function of just how much was displayed on the screen at a given time. With a full screen, the computer ran only about 10% of its original blank-screen speed.

The built-in subset of TI BASIC did not have CALL's for COLOR, SOUND, JOYST, CHAR, or SCREEN, but it did include PEEK, POKE, and MCHL, a command to execute user-written assembly language programs and subprograms.

Texas Instruments was reluctant to talk about the 99/2, but according to Alan Daniel of TI, the 99/2 was "a great computer—ahead in speed." The black and white display was its major downfall, since color came out at the same price in late 1983. "We never did it, never sold it," he said. "But we came close."

"By introducing peripherals and inexpensive software simultaneously with the computer, Texas Instruments believes this system will grow with an individual, inspire confidence in the use of computers, and foster the continued growth of the computer evolution," said Littlejohn and Jander in their article.

The 99/2 fell a bit short of those expectations, but something can be learned from it. The design team finished the job in a little over eight months, from "concept to production"—record time for introducing a new computer, they said.

Not only was the computer functional and ready to roll off the assembly line, but there were few bugs. I could find no errors as I tested my prototype, and the 99/2 had already been beta-tested.

The 99/2 also carried on the idea that the CC-40 uses—the hex-bus interface. The idea was to make a cheap, reliable, built-in interface that would allow stand-alone peripherals to be added to the computer. A printer/plotter, wafertape drive, and RS232 were already in the works. Unfortunately,

Listing on page 118
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TI Form Column Listing 1

"CINVADERS"
Copyright 1986
by Ron Albright

```
#include "DSK1.GRFLRF"
#include "DSK1.SOUNDLIB"
```

```
#asm
REF PRINTF
#endasm
```

```
int hit=0;
int landed=0;
int time=1000;
int shots=0;
```

```
main()
```

```
{
char *alien;
char *gun,*bullet;
int count,set;
hit=0;
landed=0;
time=1000;
shots=0;
```

```
alien="38100804030F1C3F03780F060C18000
00E040810E0F89CFEE00FF830180C";
gun="01010303070F0F1F3F3F7F7F00000
0008080C0C0E0E0F0F0F8F8FCFC";
bullet="000000000000000000000000000000
f00000000000000000000000000000";
```

```
grfl();
screen(2);
for(set=2;set<=12;set++)
color(set,16,2);
setup();
instructions();
hchar(1,1,42,32);
hchar(24,1,42,32);
hchar(20,1,45,32);
vchar(1,1,42,24);
vchar(1,32,42,24);
locate(22,3);
puts("SCORE:");
locate(23,3);
puts("LANDED:");
locate(22,18);
puts("TIME:");
locate(23,18);
puts("SHOTS:");
chrdef(100,alien);
chrdef(104,gun);
chrdef(108,bullet);
spmag(3);
```

```
for(count=1;count<=6;count++)
{
sprite(count,100,16,10*count,
10*count);
spmotn(count,0,10*count);
spmct(count+1);
}
sprite(7,104,16,140,92);
spmct(16);
while(1)
```

```
{
innon();
arrows();
bounce();
gunbounce();
bounds();
coinc();
timer();
sounda(1,1800,2,0,0,0,0,5,0);
if(time==0)
break;
if(hit>=10)
break;
if(landed>=10)
break;
if(shots==20)
break;
}
```

```
spdall();
clear();
finished();
```

```
timer()
```

```
{
time--;
locate(22,28);
printf("%d",time);
}
```

```
arrows()
```

```
{
```

```
int u,s,c;
u=0;
innon();
c=key(u,&s);
if(s<=0)
return;
```

```
if(c==83 | c==115)
spmotn(7,0,-20);
else if(c==68 | c==100)
spmotn(7,0,20);
else if(c==81 | c==113)
shoot();
```

```
shoot()
```

```
{
int rp,cp;
innon();
sposn(7,&rp,&cp);
sprite(15,108,7,rp,cp);
spmotn(15,-50,0);
shots++;
locate(23,25);
printf("%d",shots);
}
```

```
coinc()
```

```
{
int zap,flagged;
for(zap=1;zap<=6;zap++)
{
innon();
flagged=spcnc(15,zap,8);
if(flagged>0)
{
hit++;
sound2(1,932,2,880,0);
sploct(zap,10*zap,10*zap);
spdel(15);
locate(22,10);
printf("%d",hit);
return;
}
}
```

```
bounds()
```

```
{
int r2,c2;
sposn(15,&r2,&c2);
if(r2<=15)
spdel(15);
}
```

```
innon()
```

```
{
#asm
LIMI 2
LIMI 0
#endasm
}
```

```
bounce()
```

```
{
int bug,rp,cp;
for(bug=1;bug<=6;bug++)
{
innon();
sposn(bug,&rp,&cp);
if(cp>210)
{
sploct(bug,rp+8,cp);
spmotn(bug,0,-10*bug);
delay(1);
}
else if(cp<20)
{
sploct(bug,rp+8,cp);
spmotn(bug,0,10*bug);
delay(1);
}
else if(rp>130)
{
innon();
sploct(bug,10,10);
landed++;
locate(23,11);
printf("%d",landed);
return;
}
}
```

```
gunbounce()
```

```
{
int rp,cp;
sposn(7,&rp,&cp);
if(cp>220)
spmotn(7,0,-20);
}
```

```
else if(cp<15)
spmotn(7,0,20);
}
```

```
delay(n)
```

```
int n;
```

```
{
n=500*n;
innon();
while(n--);
}
```

```
setup()
```

```
{
int x;
hchar(1,1,42,32);
hchar(24,1,42,32);
hchar(20,1,45,32);
vchar(1,1,42,24);
vchar(1,32,42,24);
locate(21,9);
puts("C99 INVADERS");
locate(22,5);
puts("(C) 1986 RON ALBRIGHT");
locate(23,3);
puts("THANKS TO WARREN AND CLINT");
soundl(30,392,0);
soundl(6,330,0);
soundl(36,262,0);
soundl(36,330,0);
soundl(36,392,0);
soundl(50,523,0);
x=392;
while(x>110)
{
soundl(2,x,0);
x=x-30;
}
}
```

```
finished()
```

```
{
int c;
locate(10,5);
if(hit>=10)
puts("YOU WON!");
else if(landed==10)
puts("10 LANDED - YOU LOST!");
else if(time==0)
puts("YOU RAN OUT OF TIME!");
else if(shots==20)
puts("YOU RAN OUT OF SHOTS!");

locate(15,6);
puts("PLAY AGAIN? (Y/N)");
c=getchar();
if(c==121 | c==89)
main();
clear();
text();
}
```

```
instructions()
```

```
{
int c;
locate(10,8);
puts("INSTRUCTIONS? (Y/N): ");
c=getchar();
if(c=='Y' | c=='y')
{
locate(10,2);
puts("YOU HAVE 1000 TIME UNITS TO ");
locate(11,2);
puts("SHOOT 10 INVADERS. IF 10 LAND");
locate(12,2);
puts("OR TIME EXPIRES, YOU ");
locate(13,2);
puts("LOSE. SHOOT 10 INVADERS, YOU ");
locate(14,2);
puts("WIN! S AND D KEYS MOVE GUN");
locate(15,2);
puts("USE Q KEY TO SHOOT. YOU HAVE");
locate(16,2);
puts("ONLY 20 SHOTS TO FIRE!");
}
locate(18,6);
puts("PRESS ANY KEY TO START");
getchar();
clear();
}
```

The Silver Box
continued from page 116

each node and many prints in a large data file. High resolution graphics require exponentially more complex calculations. This is where sheer speed of modern computers is required and this is where the computers of tomorrow are headed.

The V20 And The BIOS

As you all know very well, the use of V20 requires a little modification of disk I/O software to restore the over-shortened timing which is executed by the V20 in much reduced number of clock cycles. This can be as short as a factor of about 5.7 when you change the CPU from 8088 to the V20. This is the reason we have to patch the FORMAT.COM and the DCOPY.COM when the CPU is switched. Then, the question arises, does the Sanyo BIOS have a similar problem? The answer is a simple yes,

as far as I'm concerned. In casual operation, you may not detect sometimes almost imperceptible but definitely reduced reliability. The difference in operation can be subtle, but you will encounter a diminished disk reliability. I never had any disk problems before I installed the speed board. However, during September 1986, I had two mysterious disk failures. Since the last of these problems, I had to carry out important jobs at the normal clock speed until I fixed the problems by upgrading the RAMs and applying some patches to the BIOS.

There was some chance that the problems might have also been related to a particular RAM chip which could have had a faulty cell or slower access time than others.

I had been using all Hitachi memory chips without any problems since 1984. In early October 1986, my system crashed without any apparent reason. I traced the problem to

a single memory chip on the motherboard. It was an MCM4164T1, the single chip which was not made by Hitachi. Sometime afterward, I remembered how it had gotten here. It arrived here on one of the add-on boards. I replaced the offending chip and all the 200 ns memories with 150 ns chips. I then patched the Sanyo BIOS. After these improvements, there has been none of the disk access problems.

When I faced the problems described above, the first thing I decided to do was to install 150 ns DRAM chips exclusively instead of 200 ns chips. At 7.3 MHz, the speed board CPU clock frequency, you have just about 205 ns CPU timing in accessing the DRAMs using V20-8. Most Japanese 200 ns DRAMs will work down to about 150 ns, but this is too close to the limits if you add up all the delays of decoding and buffer ICs.

The next thing I did was to eliminate all the "AAM" in-

structions from the timing loops in the Disk I/O routines of the Sanyo BIOS. Thanks to the Sanyo engineering team which decided to put all the disk I/O routines in the portion of the BIOS residing in the RAM, rewriting the disk I/O routines is simple. The situation for the PC-clones is different. In them, most of the I/O routines are in the ROM and you have to have a ROM writer. The whole process is anything but easy.

I checked all the Sanyo BIOS Versions for the MSDOS 2.11 I have in my collection. The results are shown in Listing 1.

Which BIOS Version To Use

In this collection of BIOS Versions in Listing 1, I became particularly curious in the two

versions of the 256K [VB] BIOS, Version 1.02 and Version 1.03, both of which have the same date stamp! Another reason why I am so interested in finding out the difference between the two versions is because I have been using both of these without knowing which one I have in my system disks. Precisely speaking, I have been using a patched BIOS with Tampa Bay Digital's Missing Link patch, but I did not know which version I had patched when I installed the Missing Link board, until I looked carefully at the copyright notice.

The BIOS 1.02 and 1.03 The difference between Version 1.02 and Version 1.03 is

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the wafertape drive had some problems: it didn't work.

An audio cassette interface, similar to the one used by the 99/4A, was included, though and OLD/SAVE CSI was supported.

Interestingly enough, the 99/2 used a TMS9995 16-bit NMOS microprocessor, one that some of the planned new 99-compatible computers of today are rumored to use.

That a computer designed in only eight months could be obsolete by the time of its introduction is not a comforting thought. Myarc's new computer has been in development

for well over a year, for example. A better combination of pricing and competition will be necessary for a new 99-compatible computer to fly, and these two factors are mostly out

of the hands of the manufacturer. For the sake of the continuation of the generation of 99-compatible computers, we must hope that history does not repeat itself.

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3M 5.25" 5250	1.30	1.20	1.11	1.04
5.25" 0800	1.82	1.66	1.50	1.45
5.25" 0800-087PI	3.10	2.94	2.73	2.55
5.25" HIGH DENSITY	3.70	3.40	3.15	2.95
3.50" 8800-1367PI	2.83	2.34	2.17	2.03
3.50" 0800-1367PI	3.03	3.32	3.00	2.80
wabash 5.25" 5250	.92	.85	.79	.73
5.25" 0800	.99	.91	.84	.79
5.25" 0800	1.15	1.06	.99	.92
5.25" 0800-087PI	1.75	1.82	1.50	1.40
5.25" HIGH DENSITY	2.50	2.35	2.15	1.98
3.50" 8800-1367PI	2.08	1.82	1.79	1.67
3.50" 0800-1367PI	2.80	2.55	2.45	2.30
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