

TANDY LAPTOP COMPUTING

APRIL 1991 -VOL. 8, NO. 2

TERRY KEPNER'S

portable 100

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A MONTHLY PUBLICATION (EXCEPT COMBINED JULY/AUGUST ISSUE)



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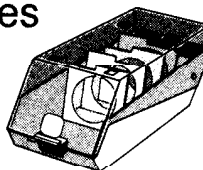
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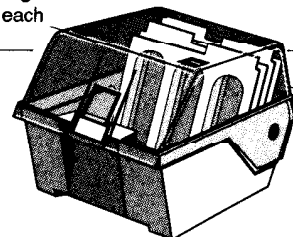
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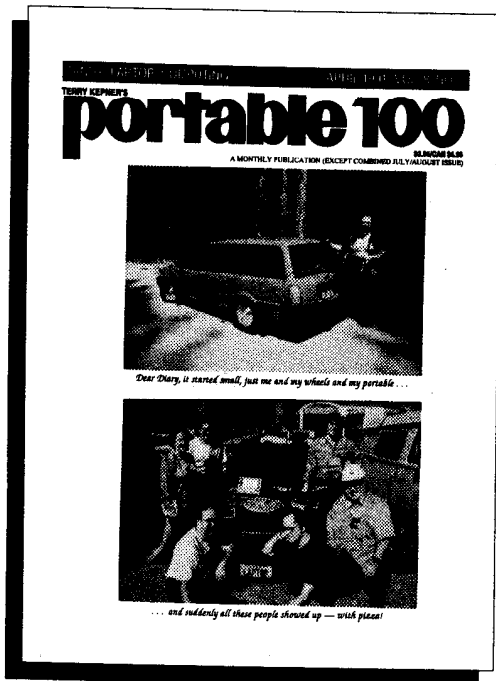
Send a picture of you using your laptop. We'll put you in our ads.

Circle 159 on reader service card.

ON THE COVER:

Top: Club 100 president Rick Hanson shows us his two favorite toys.

Bottom: Club 100 members pose with their pizza, 'puters, and pride!



IBM CHARACTER GRAPHICS ON THE MODEL T 8

by Bill Gerber
Spiff up your printouts! How to use the Epson/IBM-type character graphics on your printer with your Tandy 100, 102, or 200!

HOMEBREW MODEL T CUSTOM GRAPHICS 12

by Robert H. Pigford
Use your Tandy 100, 102, or 200 to create and print your own logos, letterheads, and other works of art!

MACHINE LANGUAGE PROGRAMMING TIPS 21

by Paul Globman
Making your Model 100, 102, and 200 programs smaller, faster and safer.

THROUGH THE (8-LINE BY 80-COLUMN) LOOKING GLASS 22

by Stan Wong
Pushing the limits of your WP-2 word processor.

CRDFIL-PC: 25

by George Sherman
The popular Model 100/102 software is now available for MS-DOS portables!

MOVING UP: CHAPTER TWO 28

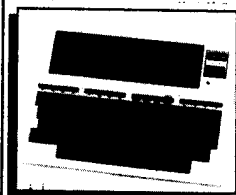
by Tony B. Anderson
More tips on moving up from a Model T to MS-DOS, plus shareware to make the going easier.

JOYRIDING IN THE MODEL T: TANDY'S "CLASSIC" LIVES! 33

by Gene Wilburn
For the new owner of a Tandy 100, 102, or 200.

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Tandy 102



Tandy 200



Tandy 600



Tandy 1400LT

ROM WITH A VIEW

John says I'm not funny anymore. (Don't looks count?) My M100-toting, long-time pal always looked forward to my offbeat humor in *P100* articles, editorials, and such. And lately, he says, it just ain't there. The more "administrative" I've become, the less chance I've had to clown around in print.

Well, rest assured, ol' buddy, that beneath this "three-piece suit," there's still a comfy pair of Papa Smurf jockey shorts! Just takin' care of business, dude. And it's been shaping up nicely, too. For example ...

The issue you're holding is eight pages (that's 25-percent) thicker! Our little 32-pager is now 40 pages—something it hasn't been since October 1987. And I'm gonna keep on being not funny until it's 48!

Check out the new ads. Club 100 is expanding their offerings. For instance, that little Konexx device on page 19 can be a lifesaver on the road.

Look at EME's ads. Their OWL is going great guns, and you should see what's in their catalog: gel-cell batteries, solar panels for power, sensors, transducers, and much more. (Betcha didn't know those things were available, did you?) Hardware heaven!

Microsense has changed their ad so you'll know more about the goodies they carry for your Tandy laptop. How about a 40 MB internal hard drive for your 1400? (Review next month!) An external floppy for your 1100 FD and my 1500 HD? (Yup, we use one regularly. Reviewed it in our Dec. '90 issue.) Give 'em a call, and tell 'em we said hello!

Pacific Computer Exchange is listing even more good deals on used Tandy equipment. We'll introduce the folks at PCE in a future issue. Meanwhile, call 'em up and make 'em feel like family!

And what about all those new ads for PCSG products? Tri-Mike Network East (yours truly) is now licensed exclusively to market and support the entire PCSG line of Model T products and services. (See the NEW PRODUCTS section for details.) There's a lot of excellent software to make your li'l lapwarmer pull ten times its own weight (a slight bit of humor, John), and I want to make sure you all know about it! In fact, I'm gonna give away some valuable stuff just to get you to try it! See any TMN East ad for details.

I'm pleased to welcome a new columnist this month. Gene Wilburn is a terrific writer and a knowledgeable fellow who still feels the magic in the Model 100 family of laptops. He's the perfect one to take new users by the hand and show them around the Model T "neighborhood," tell them what's what and what's where. We're thrilled to have you aboard, Gene, and I promise not to call your MODEL T JOYRIDE column "Mr. Wilburn's Neighborhood" anymore!

We have more good stuff in the works, which you can see in our WORKS IN PROGRESS section on page 36. In addition, we're finally launching the *P100* "Best-Of" project we've wanted to do for so long. Actually, we figured that an "All-Of" collection would serve you even better. We're assembling collections of *all* the printer articles ever run in *P100*, *all* the graphics articles, *all* the M100-to-PC/Mac articles, *all* the reviews, and so on. This will benefit me in that, when asked (for the zillionth time) by the seeker of *P100* wisdom, "How do I connect my Tandy to a Mac?" I can steer him or her to *all the info we've ever published* on the subject. And that will certainly benefit the seeker, too!

Again, for all of this to work, for *P100* to continue putting on weight, to finance the "All-Of" collections, to bring you more of what you want (you will write and tell us, won't you?), you must help. As I said here last month, this is a team effort. We're busting

Continued on page 36.

Toolbox

Manuscripts were typed into Microsoft Word 3.0 on a Tandy 1400 HD, where they were edited, spell-checked, and had basic format instructions inserted. From there they were loaded into a Tandy 4000 (80386 CPU, Tandy EGA Monitor, Tandy LP-1000 LaserPrinter) desktop computer and placed into Aldus' IBM PageMaker 3.01. Once there, design decisions on photo, figure, and listing sizes and placements were made. Here, pull quotes are placed, headlines, intros, and bylines are sized and positioned, and advertisements positioned.

Normally, the Tandy LP-1000 is capable of emulating only a Hewlett Packard Laser Printer Plus, but with the

addition of the Destiny Technology Corporation (300 Montague Expressway, Suite 150, Milpitas, CA 95035. (408) 262-9400) PageStyler 4.5MB kit, the LP-1000 is turned into a fully-compatible PostScript printer, with all 35 native fonts that are found in the Apple LaserWriter Plus printer. The Destiny PageStyler is available through the Tandy Express Order Hardware system.

Page previews were output from the Laserprinter. When everyone was satisfied with the appearance, final pages were output and artwork and lineart ads were positioned. The finished magazine was then delivered to the printer, who printed it, labeled it, and mailed it to you.

TERRY KEPNER'S portable 100

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POSTMASTER: Send address changes to: *Portable 100*, Portable Computing International Corporation, 145 Grove Street Ext., PO Box 428, Peterborough, NH 03458-0428.

WATCHDOG BARKS UP WRONG TREE

I've found an insidious error in my *WatchDog* program (*Portable 100*, May 1989). The program is supposed make sure that the Model T will not become stuck in an endless loop while waiting for a printer or phone line to respond.

The unfriendly side of my watchdog rears its head only on the Tandy 102—never on the Model 100. Wouldn't you know I'd hit on one of the few differences between the two machines!

What happens is that the watchdog runs as described for several trials—maybe two, maybe two hundred. Unpredictably, though, the 102 (never the 100) will lock up. Or worse, it will cold start with total loss of data. Some watchdog, huh? And of course, the disaster will strike during an important show-and-tell, or else out in the middle of nowhere when you aren't looking.

You might never discover the bug. The nature of the program is to sit there doing nothing most of the time, until some other program being "watched" gets stuck. And exactly what happens in the 102 depends on what is in the option ROM socket.

The cause and the solution are simple. The watchdog routine does its stuff by calling the computer's built-in warm start routine. In the Model 100 that routine begins by disabling interrupts. Those are signals from the clock chip, communication line, etc., that can grab the processor's attention. Warm start on the 102 *does not* disable interrupts.

Why the difference? Only the troglodytes at Microsoft know for sure. When you press the reset button on the back of either the 100 or the 102, the hardware itself disables the interrupts. That's the normal way a user of the computer "warm starts" it. No problem there.

But the difference is apparent if you call the warm start routine in software, as does the *WatchDog* program. If an interrupt from the clock chip comes along at the wrong instant, during option ROM check, then the interrupt goes into the option ROM—where there may be no code to handle it. The result depends on exactly what garbage is there where interrupt handling code should be.

The solution for the watchdog ma-

chine language is simply to add a disable interrupt (*DI*) instruction just before the warm start instruction (*RST 0*). Here's part of the listing:

```
JNZ EXIT
INX H
INR M
DI ;this is the only change, insert
one instruction
RST 0
EXIT: POP H
      POP PSW
      .
      .
      .
```

You must also incorporate the change into the *BASIC* loader I listed in the article. Insert a 243 in line 1050 just after the 35,52 and before the 199. And change the index in line 1010 from *FOR I=1to30* to *FOR I=0to30*. That's all.

Next time, I'll tell how I stumbled onto another difference between the 100

capped folks. Sadly—but understandably—they often have poor self images. Early on, MM and I felt we saw many ways for computers to help turn those negative self images into positive ones in a short time.

So in 1981—our TRS-80 Model I, Level 2, with a full 16K. In '83—the large 9-inch screen CP/M Kaypro II, with a monstrous 64K! And "portable," too, at only 26 pounds! Then in '86—a Model 100 laptop, upgraded with a Booster Pak, *Ultimate ROM II*, Tandy Portable Disk Drive, and TTX printer. And finally—our PC-AT in '88, with its 60 meg hard drive, 2 floppies, and a \$400 voice board and software.

Each was—and still is—an effective tool.

Remember the artificial psychologist program *ELIZA* in '81? It was astounding how quickly sullen youngsters would interact with *ELIZA*, often revealing helpful clues into their thinking which they'd NEVER show or discuss face to face.

Today it's *EGARoids* on the AT. The kids play it first, then earn future plays only after they understand—and can say and spell and explain—each syllable of a *Guinness Book of Records* biggie: *pneumonoultramicroscopicsilicovolcanoconiosis*.

Hard? Last year we taught it to 53 of 55 disbelieving (then excited) so-called "special" students in five "special" classes—20 minutes per class! ("Hey, don't you *ever* call me 'stupid' again!")

But *Mike is right!* Almost \$10,000 and too many years (and hours) later, MM and I feel "maxed out" by the technical. We're simply spending too much time updating ourselves on *Wordstar*, *Sidekick*, and the latest "better than ever" *Procomm*, and deciding whether we even WANT to begin peering into *Windows* and the like!

Mike is RIGHT! The old *Wordstar*, and the old *Procomm*, and the old AT, and the old Model 100 will all have to love each other a little longer. We're shoving twenty bucks of our newly saved loot toward the renewal of our *Portable 100* subscription. Thank you, guys!

David A. (and "Magnificent Marjorie") Ross
Las Vegas, NV

*You might never
discover the bug.*

and the 102, the *PRINT USING* bug, and how it got me into trouble!

Dr. Tracy Allen
President, EME Systems
Berkeley, CA

MIKE IS RIGHT!

Congrats on Mike Daigle's ESP. My MM ("Magnificent Marjorie,") and I had just about decided, albeit reluctantly, to let our *Portable 100* subscription lapse, when along comes Mike's tantalizingly provocatively titled article, "Know Airs Hear" (*Portable 100*, December 1990).

And he's so right!

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WORTH 1K WORDS

One reason for stepping up my ads (I may have to do more!) is the tremendous response I've gotten from your November 1990 cover photo of the Datapac. Many readers did not know about this product, and I was planning to replace it with the RAMPAC and phase out production of the Datapac. Instead, I find that the orders picked up, and many favor its more permanent attachment and wedge shape design. As a result, we will carry both, with a re-designed (IMPROVED) Datapac.

You have an excellent magazine, which provides a great benefit to us laptop users and marketers. Keep up the good work.

Ron Alspaugh
NODE Systems
Grass Valley, CA

We've all heard that one picture is worth a thousand words (or in computer terms, 1,024 words). You proved it once again, Ron! Even top-flight products like yours can benefit from the—er, exposure—of a photo.

I urge all advertisers to show our readers what they have to offer, because it's not always easy to picture what a product is, or does, from written descriptions alone. It may require a bit more space, but it's almost always worth it.

I'm glad to hear that our trusty Datapac will remain one of the best Model T memory expansions available. Congratulations, and thanks for writing!

MN

SOUPED UP AND CIVILIZED

In the December 1988 *Portable 100*, Michael Heim's article entitled "Taming The 200," outlined how to "soup up and civilize" the Tandy 200.

Since that informative article was published, several new products have become available that enhance the 200 without a lot of extra hardware.

First and foremost, the Tandy 200 would not be half the machine it is today were it not for the programming efforts of Paul Globman. His XOS programs effortlessly link all three banks, as well as enhance the built-in TELCOM program.

Secondly, NODE Systems released a 256K RAM expansion called the RAMPAC. [See ad on page 10] The beauty of this device is that it no longer requires

**We taught it to 53
of 55 disbelieving
"special" students.**

the use of the option ROM socket (again, thanks to the efforts of Paul Globman). In addition, it is smaller than a pack of cigarettes and attaches to the back of (not under) the computer.

With the option ROM socket freed, owners can now use their favorite option ROM's without conflicts. I have the *Ultimate ROM II*, and I wouldn't trade it!

We should all be thankful for the hard work and support given to our computers by these people (and that goes for *Portable 100*, too!). It's a shame that Radio Shack didn't support the Tandy 200. With a little refinement, it's a great machine.

Jim Coston
New Orleans, LA

WP2DOS CLARIFICATION

Gene Wilburn's article regarding his WP-2 translation utilities ("TWPKIT for The WP-2," March 1991) mentioned that a Radio Shack null modem cable will work with our WP2DOS program. That is not correct. "Null modem" is like saying "truck." There are several types of trucks. Our null modem cables, called *Computer<—>Link* cables, include cross-pinning (jumpers) necessary for computer-to-computer timing, to assure error-free block movement between the DOS computer and the WP-2.

WP2DOS is not a "simple" program—not just an ASCII push! Chris De Herrera, author of WP2DOS, did a fantastic job of writing a Tandy Portable Disk Drive emulator via m/I routines embedded into high-level language routines. Timing is critical! Bottom line: Club 100 *Computer<—>Link* cables do the job and are cost effective.

Just wanted to set the record straight on that one, important fact. Gene's article was well written and a pleasure to read.

Rick Hanson
Club 100
Pleasant Hill, CA

?IO—CORRECTIONS

Oops! TWPKIT for WP-2/MS-DOS file conversion ("TWPKIT for The WP-2," March '91) is licensed exclusively by Club 100 as part of their WP2DOS package. It is *not* in the public domain! However, as a courtesy to P100 readers, they've agreed to keep it available on CompuServe and the Portable 100 BBS until May 1, 1991, at which time it will be removed. Sorry for the misunderstanding!

-MN

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TMNE says "Send it back in 30 days for a full refund if you don't agree."

WRITE ROM is the definitive word processing extension for the Model 100. PCSG produced the first text formatter for the Model 100, now sold by Radio Shack as Scripsit 100. Now, 18 months later, PCSG introduced WRITE ROM. Those who have experienced it say WRITE ROM literally doubles the power of the Model 100.

WRITE ROM — as its name implies — is on a snap-in ROM. You simply open the little compartment on the back of the Model 100 with a quarter and press WRITE ROM in. It's as easy as an Atari game cartridge. You can use other ROM programs like Lucid whenever you wish.

WRITE ROM lets you do every formatting function you'd expect, like setting margins, centering, right justifying and creating headers and footers. But it does them under function key control.

WRITE ROM remembers your favorite format settings so you can print a document without any setup, but you can change any formatting or printing parameter instantly with a function key.

WRITE ROM's "pixel mapping" feature shows you an instant picture on the screen of how your printout will look on paper.

In all there are 64 separate features and functions you can do with WRITE ROM, and some of these features are truly breakthroughs for the Model 100.

First, WRITE ROM lets you do search and replace. Any word or phrase in a document can be searched for and replaced with any other phrase where the search words appear.

Second, WRITE ROM lets you send any text (formatted or not) to any other computer over the phone with just a function key. What's more, it dials and handles sign-on and sign-off protocol automatically.

Third, WRITE ROM has a wonderful feature called Library that lets you record favorite phrases, words or commonly used expressions (often called boilerplate).

Any place you wish Library text to appear you just type a code. WRITE ROM automatically inserts the text just like a Xerox Memory Writer. Picture what you can do with that kind of capability.

WRITE ROM is blindingly fast. No one can claim faster operation. Because it is on ROM, it uses virtually none of your precious RAM. It works with any printer, serial or parallel. You can make a duplicate copy of a document file under a new filename. Rename or delete (kill) any RAM file with function key ease.

This description only scratches the surface of this amazingly powerful piece of software. Dot commands allow control of such things as margins, centering, line spacing and other changes in the middle of a document. Most are WordStar™ compatible.

A mailmerge feature allows you to send the same document to every name on your mailing list, personalized for each recipient.

WRITE ROM enables you to do underlining, boldface and correspondence mode as well as any other font feature like superscripts that your printer supports, in a way that many users say "is worth the price of the program."

To underline you don't have to remember a complicated printer code. You just type CODE u, and to stop underline, CODE u again. The CODE key is to the right of your spacebar. Boldface? CODE b to start and stop. Easy to remember and do. Five different printer features of your choice.

We couldn't list all the features here. For example, you can select not just double space but triple or any other. You can use your TAB

key in a document. WRITE ROM allows you to indent. This means you can have paragraphs with a first line projecting to the left of the rest of the paragraph. WRITE ROM has a feature unique for any word processor on any computer. It's called FORM. FORM is an interactive mechanism that lets you create screen prompts so that you or someone else can answer them to fill out forms or questionnaires.

With FORM, any place that you had previously typed a GRAPH T and a prompt in a document, WRITE ROM will stop and show you at prompt on the screen. You can type in directly on the screen and when you press F8 you see the next prompt. It goes to a printer or a RAM file.

Think how you can use FORM. A doctor or nurse could use it for a patient's history with each question appearing on the screen. An insurance salesman could use it for his entire questionnaire. You could construct a series of prompts to answer correspondence, typing the answers, even using Library codes. This feature lets you answer letters in rapid-fire fashion, each with personalized or standard responses.

Before WRITE ROM you had to be a programmer to create a series of prompts. Now it's as simple as GRAPH T.

PCSG makes the claim that WRITE ROM is the easiest, fastest and most feature-rich formatter for the Model 100. We're happy to offer WRITE ROM because it expands the 100 to a dimension of text processing you cannot equal on even larger computers.

We brashly state that WRITE ROM is the best you can buy. But put that to the test. If you aren't as excited as we are, return it for a full refund. Priced at \$99. on snap-in ROM. MasterCard, VISA, American Express and COD.

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Zen and The Art of Motorcycle Madness (Or: More Thoughts About Less ...)

I just bought a new motorcycle. Well, new for me anyway. It's a black '82 Yamaha Virago, a big 750 V-twin cruiser with shaft drive. It's low and heavy and very fast.

Ron, the original owner, had bought it brand new a few years ago. He got it with the optional touring package: several hundred dollars of factory fiberglass fairing, saddlebags, and trunk. This made the bike perfect for long, long rides. Only thing is, Ron probably never rode it farther than 100 miles from home in all the time he had it.

So why pay all that extra money? Why put up, day in and day out, with all that extra weight? Why bother, when there was no advantage to it?

Well, I think that there *was* an advantage to it for Ron. I think it allowed him to enjoy the *idea* of being a tourer. I think he enjoyed the potential of it, the romance of it, the assumption other people made, as he rode up, that he was a stranger from a distant place. Just passin' through, ma'am.

I think he enjoyed the illusion.

In the town I live in, there are stores that rent computer software. Many of my friends who have IBM computers frequent these stores almost obsessively. On the average, these guys are normal Joes, blue collar workers or white collar low- to mid-level management. Their computing needs are pretty simple. So what would you suppose they rent? Games? Nope. Educational programs? Uh-uh.

They rent *WordPerfect*. *Windows*. *Excel*. *Corel Draw*. *Ventura Publisher*.

In short, they rent what are commonly known as the "best" (read: most powerful) software on the planet. Do they need them? No, they don't. Will they use them? No. But they'll install

these programs on their hard drives, they'll list them on their system menus, and they'll even replace them with the newest upgrades the minute they become available.

They'll never have the need for programs this powerful. They'll never have the time (or the self-discipline) to spend weeks or months learning the intricacies of each program. But when they fire up their systems and read the menu, they'll be able to tell themselves that their system is a powerful, state-of-the-art per-

*I can tell the client
is a little skeptical.*

sonal workstation. They like the potential of being able to use all that software.

They like the illusion.

There's nothing wrong with that. We all use illusion to buffer ourselves from life's rough edges. But sometimes it's good to do a little spring cleaning of your illusion closet, a little introspection to make sure that the illusions are serving you, and not vice versa. And the first step is to understand just what your illusions are.

It's not always comfortable.

Take me, for instance. For the last few years, I've made a living in part by writing ad copy for businesses. I have always

done this on a computer. And in this traditionally PC-dominated domain, I have marched to a different beat by using my Model T, my Tandy 102. I have to admit, I have always enjoyed the reaction I get.

For example, a restaurant: Inside, the client waits with Bruce, who runs a freelance desktop publishing bureau and often farms the writing out to me. I pull up on the motorcycle, go inside, and meet the client, helmet in one hand, leather backpack in the other. I can tell the client is a little skeptical. And that skepticism only grows when I open the backpack, pull out the Model T, and begin taking notes on this strange little machine that (let's face it) looks a little like the unholy offspring from some unnatural mating between a PC and a Nintendo.

But ...

At our next meeting, the client sees the end result. And he/she loves it. I'm happy to say they almost always do. And I smile, put the Model T in the backpack, throw a leg over the motorcycle and ride off into the sunset, leaving a grateful client, hardcopy in hand, shaking his/her head in wonder and asking Bruce, "Who *was* that masked man?"

Reality buffed to a high gloss with the wax of illusion. The Model T has worked well for me over the years. But the illusion that I can call all the shots and use whatever tools I want to is starting to catch up with me.

A couple of years ago, the raw materials I worked from were usually the client's previous brochures or a few pages of hand written or typed notes. But more and more often lately, the raw material comes to me on a disk. A PC disk. And if I don't plug that disk into a

Continued on page 11.

COMPATIBILITY:

Model 100, 102, 200 (and others with variations).

IBM Character Graphics on The Model T

(With a little help from your printer!)

by Bill Gerber

I remember seeing them used in IBM manuals in the late 1950's, but the origin of the graphic characters comprising the "upper" ASCII character set in many contemporary printers seems to be lost in antiquity. After searching high and low, even inquiring through multiple levels of a major US computer corporation, I've found no one who knows anything useful about them. In fact, I've found only a few people who are even aware of their existence.

Can anyone enlighten us as to who invented these characters, the circumstances by which they came about, their originally intended purpose, and what additional uses innovative people have made of them? Are there, for example, sets of "macros" available that would let one print the "happy face" character, a composite logo (e.g., FIDO!), or even the components of electrical circuit diagrams, by using combinations of characters from the full upper and lower ASCII character set?

Perhaps we should conduct a contest among *Portable 100* readers to see who can come up with the most innovative applications or the most elaborate graphic art using the full character set? [Go to it, readers! Meantime, we'll think up a prize for the best!—Ed.]

Whatever their origin, the graphic character set available on many printers can provide Model 100/102/200 (hereinafter referred to as "Model T") users with at least rudimentary graphics capability. The "framework" in Figure 2 provides a simple example of what can be done with these characters on Epson-compatible (IBM) printers.

So how come no one seems to use them? To begin with, the designers of the Model T and its ROM-based software seem to have gone out of their way to make it difficult to use the graphics set.

Screen Character	Keyboard Character	Decimal	Printed Character	Screen Character	Keyboard Character	Decimal	Printed Character		
v	GRAPH 7	176	⌘	A	GRAPH Q	216	⌘		
A	GRAPH A	177	⌘	I	GRAPH K	217	⌘		
O	GRAPH O	178	⌘	O	GRAPH L	218	⌘		
U	GRAPH U	179	⌘	U	GRAPH J	219	⌘		
e	GRAPH 6	180	⌘	Y	GRAPH Y	220	⌘		
.	GRAPH I	181	⌘	U	GRAPH <	221	⌘		
h	GRAPH a	182	⌘	E	GRAPH V	222	⌘		
o	GRAPH o	183	⌘	A	GRAPH X	223	⌘		
u	GRAPH u	184	⌘		GRAPH Z	224	⌘		
B	GRAPH S	185	⌘	⌘	(upper left) GRAPH I	225	⌘		
M	GRAPH T	186	⌘	⌘	(upper right) GRAPH r	226	⌘		
e	GRAPH d	187	⌘	⌘	(lower left) GRAPH #	227	⌘		
u	GRAPH .	188	⌘	⌘	(lower right) GRAPH \$	228	⌘		
e	GRAPH v	189	⌘	⌘	GRAPH %	229	⌘		
-	GRAPH =	190	⌘	⌘	GRAPH ^	230	⌘		
f	GRAPH F	191	⌘	⌘	(upper) GRAPH O	231	⌘		
h	GRAPH l	192	⌘	⌘	(lower) GRAPH W	232	⌘		
h	GRAPH 3	193	⌘	⌘	(left) GRAPH E	233	⌘		
l	GRAPH 8	194	⌘	⌘	(right) GRAPH R	234	⌘		
o	GRAPH 9	195	⌘	⌘	GRAPH A	235	⌘		
u	GRAPH 7	196	⌘	⌘	GRAPH S	236	⌘		
-	GRAPH -	197	⌘	⌘	GRAPH D	237	⌘		
h	GRAPH e	198	⌘	⌘	GRAPH F	238	⌘		
l	GRAPH i	199	⌘	⌘	GRAPH X	239	⌘		
h	GRAPH q	200	⌘	⌘	GRAPH U	240	⌘		
l	GRAPH k	201	⌘	⌘	-	GRAPH P	241	⌘	
o	GRAPH l	202	⌘	⌘	⌘	GRAPH O	242	⌘	
u	GRAPH j	203	⌘	⌘	⌘	GRAPH I	243	⌘	
y	GRAPH y	204	⌘	⌘	⌘	GRAPH J	244	⌘	
h	GRAPH n	205	⌘	⌘	⌘	GRAPH :	245	⌘	
h	GRAPH z	206	⌘	⌘	⌘	L	GRAPH M	246	⌘
o	GRAPH .	207	⌘	⌘	⌘	⌘	GRAPH >	247	⌘
A	GRAPH i	208	⌘	⌘	⌘	⌘	GRAPH <	248	⌘
E	GRAPH #	209	⌘	⌘	⌘	⌘	GRAPH L	249	⌘
l	GRAPH ^	210	⌘	⌘	⌘	⌘	GRAPH K	250	⌘
O	GRAPH (211	⌘	⌘	⌘	⌘	GRAPH H	251	⌘
U	GRAPH a	212	⌘	⌘	⌘	⌘	GRAPH T	252	⌘
l	GRAPH i	213	⌘	⌘	⌘	⌘	GRAPH G	253	⌘
E	GRAPH E	214	⌘	⌘	⌘	⌘	GRAPH Y	254	⌘
E	GRAPH D	215	⌘	⌘	⌘	⌘	GRAPH C	255	⌘

Figure 1. Comparison of Model T "upper" ASCII character set and their ASCII equivalents printed by standard Epson-compatible (IBM) printers.

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There are no markings on the keyboard to indicate which keys to press to get specific graphic characters; the set of graphic characters in the Model T ROM is only a portion of the full set incorporated into the printers; and even this subset is displaced in terms of the ASCII value of each of the characters provided in the Model T, compared to the corresponding values used in the printers. So, "it ain't easy" to use them.

MAKE IT EASY ON YOURSELF

But the task can be made easier if you're willing to take the time to make yourself a table. And *just maybe*, the information in this article will provide you

If you get
a one-for-one
correspondence,
you're "in clover."

with what you need. This assumes that the graphic characters in your printer, and their ASCII values, are the same as those in my printer. There's reason to hope that this will be so—I have two printers, each having modes that emulate functional components of two other printers, and all of these modes place the graphic characters in the same order and at the same ASCII values. But this is not universal; I once had still another printer that provided graphic characters but didn't follow this pseudo-standard.

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GRAPHICS FOR THE MODEL 100/102 AND TANDY 200

With a little help from your printer!

GRAPHIC COMPONENT	SINGLE LINES	PRNTD CHARS	SNGL U DBL H	PRNTD CHARS	DBL U SNGL H	PRNTD CHARS	DOUBLE LINES	PRNTD CHARS
CORNERS Up Left Up Right Lo Left Lo Right	Code L Code F Code I Code K	┌ └ ┐ ┘	Code I Code u Code & Code =	┌ └ ┐ ┘	Code E Code o Code (Code v	┌ └ ┐ ┘	Code k Code d Code q Code ,	┌ └ ┐ ┘
LINES Hrzntl Urtol	Code U Code 7	— 	Code U Code n	— =	Code T Code -	— 	Code T Code n	— =
"TEES" Top Left Center Right Bottom	Code 8 Code 9 Code - Grph 6 Code 3	┌ ├ ┤ ┘ └	Code # Code e Code q Code l Code .	┌ ├ ┤ ┘ └	Code # Code i Code D Code a Code ?	┌ ├ ┤ ┘ └	Code J Code y Code z Code S Code l	┌ ├ ┤ ┘ └

Figure 2. Model T keystrokes required to produce IBM graphics characters on printer.

CHARACTER GRAPHICS

To see if you can use the contents of Figure 1 directly, compare the information presented in Figure 2 with the table of upper ASCII characters for your printer. If you get a one-for-one correspondence, you're "in clover." Otherwise, you'll need to make a table similar to Figure 2 but using the appropriate tech data for your own printer. (See the *ASCII Character Code* tables in the appendices of your Model T manual.) The key to comparing the table, or making a new one, is to match the decimal (or hex) value of each character with the decimal (or hex) value of the corresponding Model T CODE and GRPH characters.

If it's not already obvious, I should caution you: When you go to create a printer graphic, what appears on your Model T screen will differ from what your printer will print! For example, the character my printer interprets as a double vertical line (produced by pressing CODE-T) appears as the trademark symbol (a T above an M) on my Model T screen. Figure 2 shows the characters that will appear on your screen, together with the characters that my printer prints. Note that in the whole set of Model T keystrokes, there is only one GRPH combination, GRPH-6; all others are CODE combinations.

M-100/102-T-200 GC									
L	r	I	F	E	r	k	F		
F	L	u	L	o	L	d	J		
1	J	=	J	v	J	,	J		
K									
U		T		7	-	n	=		
8	#	=	*	j					
9	e	=	i	J					
-	q	=	D	Y					
•6	r	=	a	S					
3	,	=	?	S					

Figure 3. "Cheat sheet" for translating Model T keystrokes to produce IBM graphics on your printer. Keep a photocopy of this with your Model T (maybe inside the battery compartment cover) for easy, quick reference.

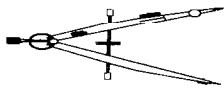
Now that you understand the general scheme of things, Figure 3 is a "cheat-sheet" version of Figure 1, sized for copying and placing somewhere (like inside the Model T's battery compartment door) for easy reference. The one GRPH character (GRPH-6) is highlighted to remind you why nothing happens when you press CODE-6.

HINTS AND KINKS

When generating printouts wider than the 40-character width of the Model T screen, the effort can become very confusing. You may find it useful to first map out the work on quadrille-ruled paper and then transfer the pattern, line by line, to the Model T. On the other hand, if your table will be less than 80 characters in width, you might be able to use a program like *View 80* (on the *Ultimate ROM II*) to keep each printable line on one screen line, thereby avoiding the confusion that arises from word-wrap.

Another hint: When printing material that includes vertical lines, you may get straighter lines by putting your printer into a unidirectional print mode (see your printer manual for details). Another fluke to watch out for: If you use *WRITE* in *Super ROM*, *CODE-u*, *-e*, and *-i* (used to command underline, emphasized, and italic, respectively) can cause some initially puzzling results.

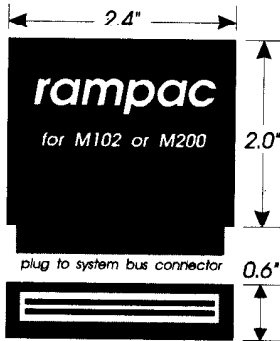
Additional capabilities can be developed using the upper ASCII character set. For mathematicians and statisticians, a capability could be developed to write mathematical or statistical notations. The approach to develop this capability should be almost identical to that used to develop the graphics capability described above.



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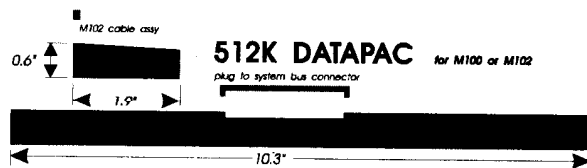
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RAMPAC, which is diagrammed on the left offers easy changeability and small size. Any number of RAMPACs can be shared with any number of Model 102 or 200's. A built-in 3+ year lithium battery (Duracell DL 2430) is user replaceable and protects data whether plugged into the laptop or not. Guaranteed the most cost effective RAM, the RAMPAC for the M102 or M200 sells for **\$129** in the 128K size and **\$169** for the 256K size. The DATAPAC, which is diagrammed below, is securely fastened underneath and to the back of the laptop with Velcro™. The DATAPAC is more permanently attached than the RAMPAC and its

wedge shape acts as "prop" legs for easier display viewing. It has been recently redesigned to double its former capacity and has a slimmer housing. The DATAPAC is available for the M100 or M102 only. Contact NODE for M200 information. It is

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Continued from page 7.

PC. I have to retype all that text into the Model T to manipulate it. I can't bill for that time, because the client provided the disks so I wouldn't have to key in the data in the first place. And when the job is done, the client expects my copy both as printouts and disk files. PC files.

Now it's true, I can use some superb tools like *LapDOS* to keep my PC and Model T talking and working together, and I have done that often in the past. But it complicates my life rather than simplifies it, and when that happens, it's time to stop and reevaluate.

In the past, I didn't have a lot of choice. The hassle of shuffling work in and out of the Model T was the price I had to—and was willing to—pay in exchange for the portability that was so important to me. But that's changed now.

For one thing, I have more clients. That means less extra time. For another, more of them are using PC's. Compatibility becomes more of an issue. And, most importantly, the Model T is no longer the only game in town for me.

As I mentioned last month, I am now the owner of an 1100 FD, Tandy's low-end PC laptop computer. I had tried to live with a WP-2 for a little while, but for reasons I won't bore you with here, I

found that I just couldn't use it for my purposes. Meanwhile, Tandy had dropped the price so much on the 1100 FD that, despite my initial dislike of the machine, I couldn't resist. So I bought one.

**Sometimes
less is more.
Sometimes
less is less.**

And I fell in love. Sometimes, first impressions can be wrong. My first impressions of the 1100 FD were not good, but—as detailed in last month's column—spending some time with the machine has shown me the errors of my ways.

So here I am, as always, with the need for portability and with a small computer that meets those needs. But, for the

first time, that computer isn't my beloved Model T.

So what of the motorcycle? Well, I pulled the big factory fairing and replaced it with a small handlebar mounted windshield. I tossed the trunk and sidebags and replaced them with a gym bag and a pair of bungee cords. Now the bike handles as well as it runs.

Sometimes less is more.

And as for the computers? Well, I've parked the Model T, its future in my life uncertain at this point. Much as I hate to say it, the 1100 FD may be the better choice for what I'm doing now.

Sometimes less is less.

And to those among you who think I've sold out, that I've done a 180 and deliberately decided to complicate my life: you're mistaken. I've come to the 1100 because it simplifies a process that I must engage in more and more often. In the months to come, I will still be trying to find the most Zen-like solutions to my needs. The machine may be different, but the goal remains the same.

Sometimes the path to enlightenment is the path of least resistance.

-by Michael Daigle



COMPATIBILITY:

Model 100, 102, and 200 (Tandy 200—see editor's note).

Homebrew Model T Custom Graphics

Create and print your own logos, letterheads, and other works of art!

by Robert H. Pigford

Have you ever wished you could design your own distinctive logo for your letterhead? Design special forms? Create and print any type of custom graphics on your "Model T" laptop? Well, you can!

SKETCH.BA and *GRAFIX.CO* will release the Rembrandt within you. Working together, they let you edit LCD screen pixels dot-by-dot, save those screen images to files, and retrieve them at any time for re-editing or printing. What's more, they give a choice of 12 sizes of screen dumps on Epson 9-pin or compatible printers.

The *GRAFIX.CO* program is called by *SKETCH.BA* as a way of providing graphics screen prints in any of 12 different height and width combinations. The 1-wide by 1-high printout is great for printing a small logo at the top of a page with a letterhead. The 4-wide by 4-high printout will almost fill the paper and is great for printing scientific graphs.

GETTING STARTED

Run *LDGRFX.BA* (Listing 2) to create the *GRAFIX.CO* program. *LDGRFX.BA* asks you to choose where in memory *GRAFIX.CO* will always load and run. If you don't want it directly under the current *HIMEM*, choose a starting address low enough that the required 2,807 bytes of memory won't conflict with any other machine language program you may wish to have active at the same time (such as a disk operating system). When the loading is complete, you are offered two user-determined configuration choices:

1. *Want Linefeeds sent to your printer upon printouts <Y/N>?* Some people set their printer to automatically throw in a linefeed every time it sees a carriage return. If so, then choose *N*. If you want the program to supply the

needed linefeeds, choose *Y*.

2. *Set printer line spacing value.* Most Epson-compatible printers use 24 (actually 24/180-inch). Printers using other values for their graphics vertical line spacing include the Gemini-10X, which uses 16. If you don't know about your printer, use the default value of 24 and see if the printouts have spaces or overlaps in the print.

You may now kill *LDGRFX.BA* after first saving it to tape or disk. If you later decide to change these values or wish *GRAFIX* to operate at a different address,

Your picture file will unfold on the screen.

you will have to run *LDGRFX.BA* again. *SKETCH.BA* is designed to find *GRAFIX.CO* in RAM and extract the *CALL* addresses it needs prior to running. Screen image files made with previous versions of *GRAFIX.CO* will be compatible with the new version.

RUNNING THE PROGRAM

Run the *SKETCH.BA* (Listing 1) program. At the first menu, press *ENTER* to continue with loading of *GRAFIX.CO* into high memory. The *HIMEM* value

TERRY KEPNER'S

portable 100

Drawn with *SKT200.BA*
and *GRF200.CO* (c) 1991,
by Robert H. Pigford

A sample of what you can do with your Model T and SKETCH.BA, done with our Tandy 200 and Tandy LP-1000 laser printer in Epson-compatible (IBM) mode.

will be set automatically. At the program's main menu, choose *I* for instructions. After reading these, choose *N* to create a new picture. The dot will start at the upper left corner. The spacebar toggles the dot on and off, and you move the dot around with the keypad directors. The computer's embedded numeric keypad keys form the eight directional keys to move the dots around:

```

& * (
u   o
j k l
    
```

When ready to save or print the screen contents, press the */* key to bring up the *GRAFIX* choices on line 8 of the picture. You may then choose one of the following:

*<Q>*uit returns you to editing where you left off

*<P>*rint will prompt you for your choices of height multiple, then width multiple desired. When the width choice is entered, the printout begins. If it doesn't, check that your printer may be off-line. If so, put it on-line to begin.

T-200 Enhancement

XOS (Cross bank Operating System) will enhance your Tandy 200 and allow the three banks to share programs and data. XOS will bring a new level of computer functionality at the MENU, from BASIC, TEXT, and TELCOM.

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Circle 121 on reader service card.

<S>ave to make a save. When *GRAFIX* completes a screen scan, it clears the screen and asks you to <1> choose a file name for saving (it creates a 1,920-byte .CO file of the image), <2> return to editing the same sketch, or <3> return to the program's main menu. Choosing <3> will ERASE your picture, so be sure to save your work first! Using the same file name as an existing file name will overwrite the old copy. Make frequent saves, and even change file names if you wish to save different copies of the same picture. When saving is complete, you are left in BASIC. Press F4 to run *SKETCH* again, or F8 to exit to the Model 100 main menu.

To work on an old file, or to get it on the screen so you can print it, choose E at the *SKETCH* main menu. When asked for a file name, enter the name of your picture file in RAM (don't use the extension). If *SKETCH.BA* can't find it, it will tell you. If found, your picture file will unfold onto the screen and leave you in dot editing mode. Toggle the dot on/off with the spacebar to help locate it.

NOTES AND HINTS

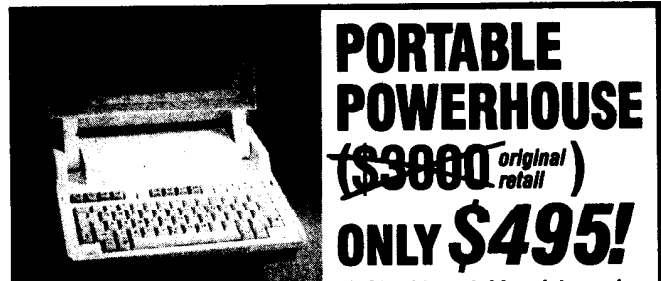
Use the CTRL-arrow keys, then the D combination as a quick way to draw lines, borders, etc.

SHIFT-arrows moves the dot 16 pixels at a time up/down and 12 pixels left/right, so if started from an edge, it can be helpful in choosing where to place text (text characters are eight dots high by six dots wide).

When using the Draw function, the second D can be cancelled by hitting CTRL-D.

The Text function is also handy for making selective erasures. Just put the dot near where you wish to erase, hit T, then

Continued on page 15.



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Circle 39 on reader service card.

```

10 'SKETCH.BA (c) 1989 by R.H.Pigford
15 'last upgrade 1/27/91
20 'uses GRAFIX.CO (c) 1989 R.H.Pigford
25 GOTO290
30 A$=INKEY$: IFA$=" " THEN30ELSERETURN
35 'pixel editing
40 CLS
45 D=1
50 A$=INKEY$
55 IFA$=>"a" THEN IFA$<="z" THEN A$=CHR$(ASC(A$)AND223)
60 IFA$=CHR$(32) THEN D=1-D: GOTO175
65 IFA$=CHR$(85) THEN X=X-1: GOTO175 'U
70 IFA$=CHR$(1) THEN X=X-12: GOTO175 's-lft
75 IFA$=CHR$(79) THEN X=X+1: GOTO175 'O
80 IFA$=CHR$(6) THEN X=X+12: GOTO175 's-rt
85 IFA$=CHR$(56) THEN Y=Y-1: GOTO175 '8
90 IFA$=CHR$(20) THEN Y=Y-16: GOTO175 's-up
95 IFA$=CHR$(75) THEN Y=Y+1: GOTO175 'K
100 IFA$=CHR$(2) THEN Y=Y+16: GOTO175 's-dn
105 IFA$=CHR$(55) THEN X=X-1: Y=Y-1: GOTO175 '7
110 IFA$=CHR$(57) THEN X=X+1: Y=Y-1: GOTO175 '9
115 IFA$=CHR$(74) THEN X=X-1: Y=Y+1: GOTO175 'J
120 IFA$=CHR$(76) THEN X=X+1: Y=Y+1: GOTO175 'L
    
```

Continued.

Listing 1. *SKETCH.BA* lets you create, edit, save, retrieve, and print custom graphics on Epson-compatible printers.

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Circle 29 on reader service card.

```

125 IFA$=CHR$(17) THEN X=0:GOTO175'ctrl+lf
    t arrow
130 IFA$=CHR$(18) THEN X=239:GOTO175'ctrl+
    rt arrow
135 IFA$=CHR$(23) THEN Y=0:GOTO175'ctrl+up
    arrow
140 IFA$=CHR$(26) THEN Y=63:GOTO175'ctrl+d
    n arrow
145 IFA$="T" OR A$="t" THEN SOUND1000,2:GOTO
    210
150 IFA$="D" THEN 545
155 IFFD=1 THEN GOSUB570
160 IFA$=CHR$(4) THEN SOUND15000,2:FD=0
165 IFA$="/" THEN 270
170 IFA$=CHR$(27) THEN 335
175 IFX<0 THEN X=0
180 IFX>239 THEN X=239
185 IFY<0 THEN Y=0
190 IFY>63 THEN Y=63
195 IFD=1 THEN PSET(X,Y) ELSE PRESET(X,Y)
200 GOTO 50 'loop back
205 'find cursor position
210 C=INT(X/6):R=INT(Y/8):L=(R*40)+C
215 L1=L'save first curs vals
220 L$=INKEY$:IF L$="" THEN 220
225 IFL$=CHR$(13) THEN SOUND5000,2:GOTO50
230 IFL$<>CHR$(8) THEN 250
235 IFL>319 THEN L=319:GOTO245
240 L=L-1:IF L<L1 THEN L=L1
245 PRINT@L," ";;GOTO220
250 IFL>319 THEN 220
255 PRINT@L,L$;:L=L+1
260 GOTO220
265 'go to GRAFIX.CO
270 CALL GF 'start of GRAFIX
275 IF PEEK(PF)=0 THEN 440'prflag
280 GOTO 50
285 'intro and menu for SKETCH.BA
290 GOSUB800:CLR@100,GF:E$=CHR$(27):CLS
295 GOSUB800:GOSUB700
300 PRINT@125," E$pENTER"E$q key to c
    ontinue or...":LINE(35,31)-(35,23),1:LIN
    E-(65,23),1
305 PRINT@205," E$pQ"E$qquit":LINE(35,
    47)-(35,39),1:LINE-(41,39)
310 GOSUB30:IF A$="Q" OR A$="q" THEN MENU
315 IFA$<>CHR$(13) THEN 310
320 ON ERROR GOTO330:LOADM"GRAFIX":GOSUB800
325 E$=CHR$(27):GOTO 335
    
```

PIXEL GRAPHICS

```

330 CLS:BEEP:PRINT"Could NOT loadm "E$p
    GRAFIX.CO "E$q!":PRINT"Hit <"E$p"ANY"E
    $"q> key!";:GOSUB30:MENU
335 PRINT E$;"W";' enable scrolling
340 CLS:GOSUB705:PRINT@40,"<Q>uit":PRINT
    @55,"<I>nstructions"
345 PRINT@80,"<N>ew Sketch":PRINT@95,"<E
    >dit EXIST.CO file.":LINE(0,7)-(239,7),1
350 LINE(2,30)-(235,63),1,B:LINE(76,20)-
    (85,20),1:LINE-(85,30),1:LINE(216,20)-(2
    25,20),1:LINE-(225,30),1
355 PRINT@161,E$p/"E$q Screen SAVE + M
    ultiple PRINT Functns."
360 PRINT@201,E$p"TE" E$q Type TEXT at do
    t then "E$pENTER"E$q"
365 PRINT@241,E$p"PD"E$q Set 1st dot, "E
    $"PD"E$q DRAW LINE to 2nd dot."
370 PRINT@281,E$p"ESC"E$q Erase picture
    and return here.":LINE(5,32)-(5,63),1
375 A$="-":GOSUB30:A=INSTR("QqIiNnEe",A$)
    :IFA=0 THEN 375 ELSE ON(A+1)/2 GOTO380,585,38
    5,395
380 MENU
385 PRINT E$;"V";:GOTO40'no scroll
390 'look for existing Ram .CO filename
    then pass it's start addr to GRAFIX
395 CLS:FILES:PRINT"Enter your existing
    PIX.CO ":PRINT"filename (w/o ext.)";:IN
    PUTS I$:IF LEN(S I$)=0 THEN BEEP:GOTO335
400 L=LEN(S I$):IF L>6 THEN BEEP:GOTO335
405 N$=S I$:GOSUB505:S I$=N$
410 PRINT E$+CHR$(M);:S I$=S I$+" .CO"
415 PRINTS I$+" Correct? <Y/N>"
420 GOSUB30:IFA$="N" OR A$="n" THEN 395
425 GOSUB900:IF NF=1 THEN 335
430 CALL FZ,,DS 'pass the RAM start Addr
    to HL register- FILLCD:
435 PRINT E$;"V";:GOTO 45
440 CLS:PRINT"<1> Save Buffer to RAM Fil
    e."
445 PRINT"<2> Return to EDITING Sketch."
450 PRINT"<3> Go to Main Menu (lose this
    sketch)."
455 GOSUB30:A=VAL(A$):IFA<1 OR A>3 THEN BEEP
    :GOTO455 ELSE ON A GOTO465,460,335
460 CALL FZ,,BS:PRINT E$;"V";:GOTO45
465 CLS:FILES:PRINT"Save Sketch File";:I
    NPUTS N$:N$=SN$:GOSUB505
470 SN$=N$:PRINTSN$+" .CO";
475 PRINT" Correct? <Y/N>":GOSUB30:IFA$=
    "N" OR A$="n" THEN 465
480 SX$=SN$:T=0:T=INSTR(SX$,"."):IF T THEN
    SN$=LEFT$(SX$,T-1) ELSE SN$=SX$
485 ON ERROR GOTO 500
490 PRINT"Hit <F4> -> SKETCH or <F8> ->
    MENU."
495 SAVEMS N$,BS,BE-1,0 'dumps to BASIC
500 BEEP:PRINT"RAM FULL! ... returning E
    DITING.":GOTO 440
505 A$="":B$="":C$="" 'capitalize
510 FOR W=1 TO LEN(N$):B$=MID$(N$,W,1)
515 B=ASC(B$)
520 IF(B>96) AND (B<123) THEN C$=CHR$(AS
    C(B$) AND 223):GOTO530
    
```

Continued.

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Circle 21 on reader service card.

Continued from page 13.

use the spacebar to print spaces over the graphics. Once erased this way, however, the dot graphics are gone. You will have to redraw them if wanted (or edit your recently saved RAM file again). If you hit *T* and then change your mind, just hit *ENTER* to finish and get back to dot editing without having put any text over the graphics.

Using *SHIFT-GRPH-X* in the Text mode can quickly fill the screen with full characters of all dots.

GRAFIX.CO does not reset all the printer settings, so when finished you will not have to reset your margins, bold, etc. Hitting *SHIFT-BREAK* while printing will return control to the *M100* program, but your printer may then be locked in graphics mode requiring you to turn it off to completely clear it.

To conserve RAM, you can shorten the *SKETCH.BA* program as follows:

1. Edit out the instructions (just change line 585 to *BEEP:GOTO335* and delete lines 590-695).
2. Remove the *LINE* commands (but not from line 555).
3. Edit out all remarks and all lines that contain only remarks.

Have fun!

Robert Pigford holds a BS degree in Mechanical Engineering, is a Registered Professional Engineer in two states, and does automatic control system engineering for a major global chemical company. Although he uses many "more powerful" computers at work, he still enjoys the simple, powerful, and overall more productive M100/102/200 family, and finds programming them such a nice break from all that MS-DOS hype.

Editor's note: For space reasons, only the Model 100/102 BASIC listings appear here. These programs, assembly language source code, and Tandy 200 versions of these programs are all available on CompuServe's Model 100 Forum, our Portable 100 BBS (see masthead for telephone number and TELCOM stats), and on this month's P100-To-Go disk.—MN



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Circle 148 on reader service card.

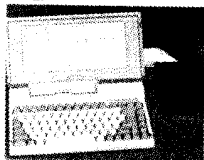
```

525 C$=B$
530 A$=A$+C$
535 NEXTW:N$=A$:RETURN
540 'record points, draw/erase line
545 IFFD=0THENX1=X:Y1=Y:FD=1:SOUND1047,2
:GOTO50
550 X2=X:Y2=Y
555 IFD=1THENLINE(X1,Y1)-(X2,Y2),1ELSELI
NE(X1,Y1)-(X2,Y2),0
560 FD=0:FB=0:SOUND1760,2:GOTO50
565 'make the DRAW or BOX anchor pixel
flash
570 IFZ=0THENPRESET(X1,Y1)ELSEPSET(X1,Y1
)
575 Z=1-Z:RETURN
580 'instructions
585 CLS:GOSUB705:PRINT@40,"A drawing pro
gram, using the keys"
590 PRINT"forming the keypad for the
& * ("
595 PRINT"dot drawing directions. Togg
le U 0"
600 PRINT"the dot on/off with the
J K L"
605 PRINTE$"p space bar "E$"q. Combine
Shft+ARROWS"
610 PRINT"to jump 16 dot's, and use Cntr
l+ARROWS"
615 PRINT"to move to edges.
---more>;:LINE(201,13)-(236,41),1,B:GOS
UB30
    
```

Continued.

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Circle 45 on reader service card.

```
620 CLS:PRINT"With the dot on a normal c
haracter"
625 PRINT"location, hit "E$"pT"E$"q to i
nitiate TEXT on"
630 PRINT"screen. Use "E$"pENTER"E$"q w
hen done."
635 PRINT"Use "E$"pD"E$"q once to set an
chor point for"
640 PRINT"a line. Move, hit "E$"pD"E$"q
again to DRAW line."
645 PRINT"If the second dot is 'off', th
e line"
650 PRINT"will erase. Cancel 2nd "E$"pD
"E$"q with Crtl-D."
655 PRINT"With your SKETCH on screen,
----more>";:GOSUB30
660 CLS:PRINT"<ESC> = erase sketch, go t
o Main Menu."
665 PRINT"</> to bring up the "E$"p GRAF
IX "E$"q options : "
670 PRINT" <P>print screen. Choose from
12 "
675 PRINT" possible Width/Height comb
inations."
680 PRINT" <S> Scans screen, asks SAVE
filename?"
685 PRINT" Dumps to BASIC. Use F4 to
RUN again.";
690 PRINT" <Q>uit = return to SKETCH ed
iting."
695 PRINT"That's all. Any Key ->
MAIN MENU";:GOSUB30:GOTO 335
700 PRINT@41,"Newark, DEL. Uses Himem"GF
"to"BE;
705 PRINT@0," "E$"pSKETCH.BA"E$"q & "E$"
pGRAFIX.CO"E$"q "CHR$(171)"1989 R.H.Pigf
ord"
710 LINE(77,0)-(77,7).1:LINE(5,0)-(5,7),
1
715 RETURN
795 'find appropriate address values
800 SI$="GRAFIX.CO":GOSUB900
805 IF NF=1THENEND
```

```
810 GF=PEEK(DS+3)+256*PEEK(DS+4)'start G
RAFIX.CO
815 PF=PEEK(DS+5)+256*PEEK(DS+6)'PRFLAG:
addr.
820 BS=PEEK(DS+7)+256*PEEK(DS+8)'BUFFER:
start addr
825 BE=PEEK(DS+9)+256*PEEK(DS+10)'end
830 FZ=PEEK(DS+11)+256*PEEK(DS+12)'FILLC
D
835 CLS:RETURN
895 'get FILE.CO addr references
900 SS$=" "
905 SP$=SI$:T=INSTR(SP$,"."):IFTTHENSP$=
LEFT$(SP$,T-1)
910 SP$=SP$+SS$
915 SP$=LEFT$(SP$,6):FORD=63919T064128ST
EP11:T=PEEK(D)
920 IFT=160ANDPEEK(D+3)=ASC(SP$)THENFORT
=2T06:IFPEEK(D+2+I)=ASC(MID$(SP$,I))THEN
NEXTI:DS=256*PEEK(D+2)+PEEK(D+1):SP$=SP$
+ ".CO":NF=0:GOTO935
925 NEXTD:SP$=SP$+".CO":PRINTSP$+" NOT F
OUND!";:BEEP:FORT=1T0300:NEXTT:NF=1:GOTO
940
930 'get appropriate RAM addr of .CO fil
e and pass to GRAFIX.CO
935 DS=DS+6 'move to actual file data
940 RETURN
```

End of listing 1.

```
0 'LDGRFX.BA loads GRAFIX.CO -> 100/102
5 '(c) 1989, R. H. Pigford, Newark, DE
10 'Loader style learned from DIRACC.BA
15 'by S. Burgoyne & H. Ferreyra
20 GOTO 35
25 Z=1-Z:PRINT@193,CHR$(229+Z);:RETURN
30 A$=INKEY$:IF A$="" THEN30ELSERETURN
```

Continued.

Listing 2. LDGRFX.BA creates the GRAFIX.CO program used by SKETCH.BA.

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Circle 151 on reader service card.

```

35 CLS:PRINT "Loader for "CHR$(27)+"p GRA
FIX.CO "CHR$(27)+"q (2807 bytes).":PRINT
@44,CHR$(171)" 1989 R. H. Pigford, Newar
k, DE"
40 PRINT "<1> load just below HIMEM."
45 PRINT "<2> load at ANY address."
50 PRINT "<3> QUIT."
55 GOSUB30:X=VAL(A$):IFX<1ORX>3THEN55ELS
EONXGOTO65,75,60
60 MENU
65 AD=HIMEM:CLEAR256,AD-2807:SA=HIMEM
70 PRINT "Loading under old HIMEM.":GOTO9
0
75 INPUT "Start Address ";SA
80 IF SA<32768ORSA>60150THENBEEP:GOTO35
85 CLEAR 256,SA:SA=HIMEM
90 PRINT "Loading from "SA"to"SA+2807
95 D$="0123456789ABCDEF"
100 M=SA
105 A=SA:FOR J= 1 TO 60
110 READ LN$:FOR I=1 TO LEN(LN$) STEP 2
115 C1=(INSTR(1,D$,MID$(LN$,I,1))-1)*16
120 C2=INSTR(1,D$,MID$(LN$,I+1,1))-1
125 POKE A,C1+C2:A=A+1:NEXTI:M=M+(LEN(LN
$)/2):PRINT@270,M;:GOSUB25:NEXT J
130 'poke in adjusted CALL addresses
135 PRINT@310,"ADJUSTING";
140 FOR I=1 TO 124
145 READ C,R
150 HI=INT((SA+R)/256):LO=(SA+R)-HI*256
155 POKE (SA+C),LO:POKE (SA+C+1),HI
160 GOSUB25:NEXTI
165 'poke in buffer RET values
170 PRINT@310,STRING$(9," ");:FOR X=1 TO
1920:POKE (SA+886+X),210:GOSUB25:M=M+1:
PRINT@270,M;:NEXTX:BEEP
175 'adjust optional features
180 LF$="Y":L=24:N$="GRAFIX"
185 CLS:PRINT "Toggle "CHR$(27)+"p GRAFI
X.CO "CHR$(27)+"q options then save."
190 PRINT@40,"CODE now loaded:"SA" - "(S
A+2800)
195 PRINT@80,"<1> Send Linefeed with CR

```

```

(Y/N)..":PRINT@115,LF$
200 PRINT@120,"<2> Value for Linespacing
.....":PRINT@154,L
205 PRINT:PRINT@200,"<3> Create "CHR$(27
)"p "N$+".CO "CHR$(27)"q"
210 GOSUB 30:A=VAL(A$):IFA<1ORA>3THEN195
ELSEONAGOTO 215,235,250
215 'toggle LF or NO LF decision
220 IFLF$="Y"THENLF$="N":GOTO230
225 IFLF$="N"THENLF$="Y"
230 GOTO195
235 'line increment value for printer
240 CLS:PRINT "Check your printer manual.
":PRINT " Epson uses 24":PRINT " Gemini
10x uses 16":PRINT " Diconix (DIP #5 = 0
) uses 24":PRINT " HP Quietjet (DIP #5 u
p) uses 24"
245 INPUT "Value for line spacing increme
nt";L:GOTO185
250 'POKE values of options then SAVE
255 IF LF$="N" THEN 260 ELSE 265
260 FOR I=SA+795 TO (SA+795+4):POKE I,0:
NEXTI
265 'poke linespacing value
270 POKE (SA+751),L
275 'save and return to main menu
290 PRINT "Any key to SAVEM "CHR$(34)N$CH
R$(34);:GOSUB30
295 SAVEM N$,SA,SA+2807-1,SA
300 END
305 'hex vals assembled from GRAFIX.DO
310 DATA "C303EBF6EA7AEC6DEEEDF573EB3E01
315 DATA "327AEC210801CD42EDCDA1EB2138EB
320 DATA "CDA211CD96EBCDE80FFE50CAABEBFE
325 DATA "53CA60EBFE51CA2FEB317EBCD5BEE
330 DATA "1E38CD60EDC91B704752414649581B
335 DATA "7120AB524850203C503E72696E7420
340 DATA "3C533E617665202E2E3C513E756974
345 DATA "00CD5BEE1E38CD60ED3E00327AEC21
350 DATA "0101C3FAEB226BEE3E05327AEC1100
355 DATA "0915C8D5CD60ED11F0002A6BEE1922
360 DATA "6BEE17BC6085FC37EEBB7CD4272CA
365 DATA "96EBCDE80FC9210801CD7C42CD5D42

```

Continued on page 20.

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□ WPduet

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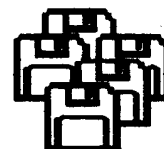
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Continued from page 17.

```

370 DATA "C9CDA1EB2121ECCDA211CD96EBFE31
375 DATA "FAB4EBFE33CAB4EBFE35F2B4EBD630
380 DATA "327AECDA1EB213EECCDA211CD96EB
385 DATA "FE31FAD4EBFE35F2D4EBD630327BEC
390 DATA "CD5CECCD5BEE1E38CD60ED210101CD
395 DATA "DAEDDA41EECD42EDE53A7AECA7CA14
400 DATA "ECFE01CA8AECFE02CAA4ECFE04CA00
405 DATA "EDE12C3E09BDCA41EE2601C3FAEB50
410 DATA "727420484549474854206D756C7469
415 DATA "706C653F203C312C322C343E005072
420 DATA "74205749445448206D756C7469706C
425 DATA "653F203C312C322C332C343E003A7B
430 DATA "EC47110300217EEC7EB8CA6FEC19C3
435 DATA "66EC237E327CEC237E327DECC90101
440 DATA "000001F00002E00103D00204C003CD
445 DATA "EAED1EF0216DEE7ECD17EEDA37EE23
450 DATA "1DC292ECCD0CEEC314EC06021680CD
455 DATA "EAED1EF0216DEE0E007EA2C4ECEC/A
460 DATA "0F577EA2C4F1EC7A0F577EA2C4F6EC
465 DATA "7A0F577EA2C4FBEC7A0F707075779CD
470 DATA "17EEDA37EE231DC2B0ECCD0CEE1608
475 DATA "05C2A8ECC314EC79F6C04FC979F630
480 DATA "4FC979F60C4FC979F6034FC9060416
485 DATA "80CDEAED1EF0216DEE0E007EA2C438
490 DATA "ED7A0F577EA2C43DED7A0F75779CD17
495 DATA "EEDA37EE231DC20CEDCD0CEE7A0F0F
500 DATA "5705C204EDC314EC79F6F04FC979F6
505 DATA "0F4FC9CD5BEECD4942CD7C42F5CD2B
510 DATA "FFF1F5CD97FDF1243F29BCC248EDCD
515 DATA "4E42C906800E0016002A6BEE0C79FE
520 DATA "09C8E57EA0D5C5C28BEDCA91EDC1D1
525 DATA "E123147AFEF0C26EED780F471CC364
530 DATA "EDCD4C74C379EDCD4D74C379ED21EB
535 DATA "FF2C7E2FCDB5EDE5CDACEDE17DFEF1
540 DATA "C29AEDC92A6BEE7723226BEEC9471E
545 DATA "080E00CDBFED79C978CDCFED780F47
550 DATA "79074F1D7BC2BFEDC9E601C4D5EDC9
555 DATA "79F6804FC93E1BCD3F6D3E33CD3F6D
560 DATA "3E18CD3F6DC93E1BCD3F6D3E4CCD3F
565 DATA "6D3A7CECCD3F6D3A7DECCD3F6DC93E
570 DATA "1BCD3F6D3E32CD3F6DC93E0DCD3F6D
575 DATA "3E0ACD3F6DC9A7C5E5217BEC46E1CD
    
```

```

580 DATA "3F6D05CA29EEC31FEEC1C93EFF0000
585 DATA "0000003DC8C32DEEE1CD2942CD2942
590 DATA "C303EB3A7AECA7CA54EECD01EECD29
595 DATA "42CD4E42C303EBBCD2942CD2942C9E5
600 DATA "3A7AECA7CA69EE216DEE226BEEE1C9
605 DATA "0000
610 'adjustable address values
615 DATA 1,13,3,0,5,388,7,887,9,2807
620 DATA 11,125,16,388,22,588,25,171
625 DATA 28,66,34,160,42,181,47,106,52
630 DATA 57,55,33,58,869,63,618,107,869
635 DATA 112,618,117,388,123,260,126
640 DATA 885,131,388,140,618,146,885
645 DATA 150,885,158,136,165,160,182
650 DATA 171,185,299,191,160,196,190
655 DATA 201,190,206,190,211,388,214
660 DATA 171,217,328,223,160,228,222
665 DATA 233,222,238,389,241,358,244
670 DATA 869,249,618,255,740,258,843
675 DATA 261,588,265,388,269,286,274
680 DATA 404,279,430,284,522,292,843
685 DATA 297,260,359,389,366,392,371
690 DATA 377,375,368,380,390,385,391
695 DATA 405,756,410,887,414,801,417
700 DATA 833,422,412,425,790,428,286
705 DATA 435,756,440,887,447,502,455
710 DATA 507,463,512,471,517,480,801
715 DATA 483,833,488,442,491,790,497
720 DATA 434,500,286,527,756,532,887
725 DATA 539,578,547,583,554,801,557
730 DATA 833,562,534,565,790,573,526
735 DATA 576,286,589,869,599,821,604
740 DATA 673,612,594,625,885,638,661
745 DATA 641,667,652,632,659,622,665
750 DATA 643,671,643,680,703,684,694
755 DATA 691,676,695,885,700,885,709
760 DATA 713,715,729,726,713,732,735
765 DATA 767,390,773,391,805,389,814
770 DATA 819,817,809,831,823,841,13,844
775 DATA 388,848,862,851,779,860,13,871
780 DATA 388,875,883,878,887,881,885
    
```

End of listing 2.

COMPATIBILITY: Model 100, 102, and 200 (sometimes others, with changes).

Machine Language Programming Tips

Make your programs smaller, faster, and safer.

by Paul Globman

I believe that over time, most assembly language programmers develop their own handy little routines to do one thing or another. I would like to share a couple of tips that I often use, which will save a few bytes in your program, and make your program run faster and safer.

M/L TIP #1

Assembly language programs must leave no stones unturned, and the programmer is responsible for considering every possibility that the program might encounter. This includes errors, subroutine redirection, and stack manipulation.

The Model 100 ROM operating system is very capable of managing free RAM, allocating file buffers for BASIC programs, and maintaining the computer's "stack area." Most assembly language programs assume that the stack is properly positioned and make no attempt to alter or relocate the stack.

This is common and not incorrect in the Model 100 environment, but depending upon the program, the stack could become larger than expected, and run into an area of memory that should not be used. Here's an example of how this could happen... consider this program...

```
begin: call display
       call get_input
       call function
       jmp begin
```

Now suppose you are in the middle of the *function* routine, and you discover the input is not valid. You wish to send the user a beep, and start over again. Since you got to the *function* routine via a *CALL*, the stack is holding the return address of the call. So a simple beep and return will not restart the program, and a

beep with a *JMP BEGIN* will leave the stack with the previous *CALL*'s return address still on the stack.

You could have an error routine and *JMP ERROR*. The error routine could pop the unwanted address off the stack, BEEP and *JMP BEGIN*, for example...

```
error: pop h
       call beep
       jmp begin
```

This type of error trap is okay, but the *POP H* instruction requires that *ERROR* should only be jumped to when only one *CALL* instruction has been executed.

Assembly language programs must leave no stones unturned.

Very often programmers write all their routines as subroutines. So routine #1 will call routine #2, which calls routine #3, which encounters an error. Now the above *ERROR* routine will not solve the problem of keeping the stack balanced ("balanced" means a *RETURN* for every *CALL* and a *POP* for every *PUSH*). If this happens frequently in a program, the stack pointer can quickly run down into an area of memory containing data or programs, and cause program malfunction, destroyed files and programs, or

even cold starts.

Here's how to ensure stack balancing, regardless of how many nested *CALLS*, or unmatched *PUSHes* you have executed. You can break out to an error routine without concern of stack pointer housekeeping.

```
start: lxi h,0
       dad sp
       shld begin+1
;
begin: lxi sp,0
       call display
       call get_input
       call function
       jmp begin
;
error: call beep
       jmp begin
```

By executing the three instructions before *BEGIN*, you ensure that every time you *JMP BEGIN* the stack pointer is reset. This is done by making the first instruction of *BEGIN* restore the stack pointer to its original value. You can *JMP ERROR* (or *JMP BEGIN*) at any time without concern about *CALLS*, *PUSHes*, or stack balancing.

I would also point out that this technique can be used more than once within a single program, thus restoring the SP register to what it should be at different parts of the program. This will allow the program to freely abort subroutines when necessary, and spare the programmer the need to write special "house-keeping" code for each aborted subroutine.

M/L TIP #2

Very often the assembly language programmer will use *DB* and *DW* state-

Continued on page 32.

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Continued from page 17.

```

370 DATA "C9CDA1EB2121ECCDA211CD96EBFE31
375 DATA "FAB4EBFE33CAB4EBFE35F2B4EBD630
380 DATA "327AECDDA1EB213EECCDA211CD96EB
385 DATA "FE31FAD4EBFE35F2D4EBD630327BEC
390 DATA "CD5CECCD5BEE1E38CD60ED210101CD
395 DATA "DAEDDA41EECD42EDE53A7AECA7CA14
400 DATA "ECFE01CA8AECFE02CAA4ECFE04CA00
405 DATA "EDE12C3E09BDCA41EE2601C3FAEB50
410 DATA "727420484549474854206D756C7469
415 DATA "706C653F203C312C322C343E005072
420 DATA "74205749445448206D756C7469706C
425 DATA "653F203C312C322C332C343E003A7B
430 DATA "EC47110300217EEC7EB8CA6FEC19C3
435 DATA "66EC237E327CEC237E327DECC90101
440 DATA "000001F00002E00103D00204C003CD
445 DATA "EAED1EF0216DEE7ECD17EEDA37EE23
450 DATA "1DC292ECCD0CEEC314EC06021680CD
455 DATA "EAED1EF0216DEE0E007EA2C4ECEC7A
460 DATA "0F577EA2C4F1EC7A0F577EA2C4F6EC
465 DATA "7A0F577EA2C4FBEC7A0F707075779CD
470 DATA "17EEDA37EE231DC2B0ECCD0CEE1608
475 DATA "05C2A8ECC314EC79F6C04FC979F630
480 DATA "4FC979F60C4FC979F6034FC9060416
485 DATA "80CDEAED1EF0216DEE0E007EA2C438
490 DATA "ED7A0F577EA2C43DED7A0F75779CD17
495 DATA "EEDA37EE231DC20CEDCD0CEE7A0F0F
500 DATA "5705C204EDC314EC79F6F04FC979F6
505 DATA "0F4FC9CD5BEECD4942CD7C42F5CD2B
510 DATA "EEF1E5CD97EDE1243E29BCC248EDCD
515 DATA "4E42C906800E0016002A6BEE0C79FE
520 DATA "09C8E57EA0D5C5C28BEDCA91EDC1D1
525 DATA "E123147AFEF0C26EED780F471CC364
530 DATA "EDCD47C4379EDCD4D74C379ED21EB
535 DATA "FF2C7E2FCDB5EDE5CDACEDE17DFEF1
540 DATA "C29AEDC92A6BEE7723226BEEC9471E
545 DATA "080E00CDBFED79C978CDCFED780F47
550 DATA "79074F1D7BC2BFEDC9E601C4D5EDC9
555 DATA "79F6804FC93E1BCD3F6D3E33CD3F6D
560 DATA "3E18CD3F6DC93E1BCD3F6D3E4CCD3F
565 DATA "6D3A7CECCD3F6D3A7DECCD3F6DC93E
570 DATA "1BCD3F6D3E32CD3F6DC93E0DCD3F6D
575 DATA "3E0ACD3F6DC9A7C5E5217BEC46E1CD
    
```

```

580 DATA "3F6D05CA29EEC31FEEC1C93EFF0000
585 DATA "0000003DC8C32DEEE1CD2942CD2942
590 DATA "C303EB3A7AECA7CA54EECD01EECD29
595 DATA "42CD4E42C303EBBCD2942CD2942C9E5
600 DATA "3A7AECA7CA69EE216DEE226BEEE1C9
605 DATA "0000
610 adjustable address values
615 DATA 1,13,3,0,5,388,7,887,9,2807
620 DATA 11,125,16,388,22,588,25,171
625 DATA 28,66,34,160,42,181,47,106,52
630 DATA 57,55,33,58,869,63,618,107,869
635 DATA 112,618,117,388,123,260,126
640 DATA 885,131,388,140,618,146,885
645 DATA 150,885,158,136,165,160,182
650 DATA 171,185,299,191,160,196,190
655 DATA 201,190,206,190,211,388,214
660 DATA 171,217,328,223,160,228,222
665 DATA 233,222,238,389,241,358,244
670 DATA 869,249,618,255,740,258,843
675 DATA 261,588,265,388,269,286,274
680 DATA 404,279,430,284,522,292,843
685 DATA 297,260,359,389,366,392,371
690 DATA 377,375,368,380,390,385,391
695 DATA 405,756,410,887,414,801,417
700 DATA 833,422,412,425,790,428,286
705 DATA 435,756,440,887,447,502,455
710 DATA 507,463,512,471,517,480,801
715 DATA 483,833,488,442,491,790,497
720 DATA 434,500,286,527,756,532,887
725 DATA 539,578,547,583,554,801,557
730 DATA 833,562,534,565,790,573,526
735 DATA 576,286,589,869,599,821,604
740 DATA 673,612,594,625,885,638,661
745 DATA 641,667,652,632,659,622,665
750 DATA 643,671,643,680,703,684,694
755 DATA 691,676,695,885,700,885,709
760 DATA 713,715,729,726,713,732,735
765 DATA 767,390,773,391,805,389,814
770 DATA 819,817,809,831,823,841,13,844
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       call beep
       jmp begin
```

This type of error trap is okay, but the *POP H* instruction requires that *ERROR* should only be jumped to when only one *CALL* instruction has been executed.

Assembly language programs must leave no stones unturned.

Very often programmers write all their routines as subroutines. So routine #1 will call routine #2, which calls routine #3, which encounters an error. Now the above *ERROR* routine will not solve the problem of keeping the stack balanced ("balanced" means a *RETURN* for every *CALL* and a *POP* for every *PUSH*). If this happens frequently in a program, the stack pointer can quickly run down into an area of memory containing data or programs, and cause program malfunction, destroyed files and programs, or

even cold starts.

Here's how to ensure stack balancing, regardless of how many nested *CALL*s, or unmatched *PUSH*es you have executed. You can break out to an error routine without concern of stack pointer housekeeping.

```
start: lxi h,0
       dad sp
       shld begin+1
;
begin: lxi sp,0
       call display
       call get_input
       call function
       jmp begin
;
error: call beep
       jmp begin
```

By executing the three instructions before *BEGIN*, you ensure that every time you *JMP BEGIN* the stack pointer is reset. This is done by making the first instruction of *BEGIN* restore the stack pointer to its original value. You can *JMP ERROR* (or *JMP BEGIN*) at any time without concern about *CALL*s, *PUSH*es, or stack balancing.

I would also point out that this technique can be used more than once within a single program, thus restoring the SP register to what it should be at different parts of the program. This will allow the program to freely abort subroutines when necessary, and spare the programmer the need to write special "housekeeping" code for each aborted subroutine.

M/L TIP #2

Very often the assembly language programmer will use *DB* and *DW* state-

Continued on page 32.

Through the (8-Line by 80-Column) Looking Glass

*Here's a new monthly column
to help you get the most from your WP-2!*

by Stan "Skateboard in Wonderland" Wong

It was a dark and stormy night. A scream pierced the night. It was obvious. The butler did it! Case closed.

I leaned back in my chair to contemplate the words I'd just written, softly glowing at me from the screen of my WP-2. Yes, sir, my great American novel was beginning to take shape. The phone rang. It was Nuge advising me that I was late with my new WP-2 column.

This column, F1/F2, is a new feature devoted to Tandy's WP-2 Portable Wordprocessor. Those of you familiar with my other work in *Portable 100* may wonder why a techno-nerd like me is writing about a word processor. Well, I own one and I use it a lot. In fact, I use it more than my Model 100. That and my propensity toward verbosity make me well-qualified to write this column.

Each month, we'll explore the capabilities and mysteries of the WP-2 (like figuring out what happened to the WP-1!). I intend to focus on the WP-2 as a tool. There will be a lot of basic "how-to" articles, such as what to do with the machine right out of the box. The hacker within me, though, can't resist occasionally devoting a few words to some of the esoteric technology lurking within that sexy, sleek black case.

Here are some of the topics we'll cover:

- Hooking up a printer
- Document formatting
- Embedded printer codes
- Editing tricks and traps
- Embedded formatting for PC word processors
- Memory expansions
- Disk and tape storage
- Using the scheduler
- Using the dialer
- Hooking up a modem

- Portable modems
- "Big Iron" connectivity
- WP-2 programming
- Tutorials
- And lots more!

Computers are great. You can make them do anything you want. But the emphasis is on *you*. You have to set them up and configure them to do your bidding. You could think of them as blank canvases upon which you color, with a spreadsheet here, a word processor there, and a splash of utilities. The WP-2,

**You can move a
whole paragraph
with your
electronic "scissors
and paste."**

on the other hand, is configured right out of the box to do one job and do it well: writing.

Like most of you, I'm a long-time Model 100 user and abuser. Hence, my comments on the WP-2 will draw parallels to the Model 100, using it as a frame of reference rather than a standard for comparison.

I don't consider the WP-2 to be a real computer. Neither does Tandy. They market it as a word processor, and it

lacks the other Tandy computers' built-in programming languages, like *BASIC*. There *is* a microprocessor inside, and you *can* program it, but that's another (hacker) story.

The WP-2 is the best of a typewriter and a computer. As with a typewriter, you can correct mistakes using the electronic equivalent of correction tape. Unlike a typewriter, the WP-2 lets you correct really big boo-boos. For example, you can move a whole paragraph with your electronic "scissors and paste." Plus, you get a spelling checker and thesaurus built in.

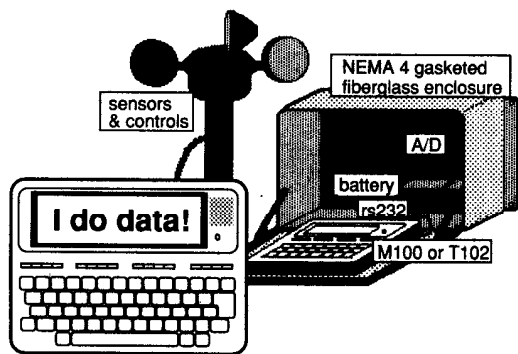
The best thing about the WP-2 is that it's configured right out of the box to make you look good on paper. Heck, if it can make my tortured prose look good, it can make *anyone* look good!

Another important plus: There's no printing mechanism built in. You don't have to lug around a bulky, heavy mechanism just for the purpose of writing. If you must produce finished documents on the road, then perhaps you need an electronic typewriter. On the other hand, most places I go, I can beg someone to let me use their printer.

SHARE AND SHARE ALIKE

If your WP-2 will be sharing a printer with your desktop machine, constantly swapping the printer cable can become a real hassle. You may want to consider using an A-B switch box to let you print from either machine at the flick of a switch.

An A-B box (Figure 1) has three 25-pin ports on the back labeled *A*, *B*, and *C*. Your printer's cable connects to the *C* port, and a regular 25-pin serial cable goes from your PC's printer port to the *A* port. By connecting another 25-pin serial cable to port *B* and routing it to the front



The OWL is our M100/T102-based *On-site Weather Logger*. In addition to the computer, the OWL consists of our analog-to-digital hardware to convert sensor readings into digital form, *HOOT* software to direct the process and display the results, and other elements like our powersaver hardware and a form-fit industrial case. You already know about the screen, the keyboard, the programmability and the economy of the M100/T102 computer. In combination, the OWL is a total solution for environmental monitoring & control. It has found application in everything from planning pest & frost control strategies in orchards large and small, to tracking endangered species of bats at their nest sites, to control of incubators and HVAC.

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 - temperature, humidity, windspeed & direction, light level, rainfall, surface moisture, pH, pressure, voltage current and more.
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of the box, you can easily plug it into the WP-2's printer port whenever you wish.

With the selector switch in the *A* position, the path from your PC to the printer is active. Select the *B* position when you want to print from the WP-2.

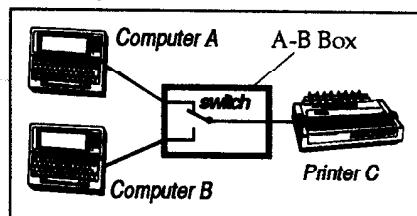


Figure 1. The A-B box lets two computers share a printer.

Serial switch boxes usually have female (socket) connectors, so both serial cables need male (plug) connectors on both ends. I make my own cable from bulk ribbon cable and compatible plastic connectors. You can obtain pre-made cables at any good computer store or electronics supply house. (Make sure they have full 25-pin connections. Some "modem" cables have only nine wires connected internally.)

My own setup actually involves the use of an X-switch (Figure 2), which lets me connect *two* printers and *two* computers and select either printer from either computer. Connecting the X-box is straightforward, and the wiring is only a bit more complicated than the A-B setup.

An X-switch provides four possible

paths: *A-AA/B-BB* and *A-BB/B-AA*, where *A* and *B* are the two input ports, and *AA* and *BB* are the two output ports. My primary computer and printer, a 386SX desktop and HP Laserjet, are connected to *A* and *AA*, respectively. The WP-2 cable and my secondary printer, a Xerox daisywheel, are connected to *B* and *BB*.

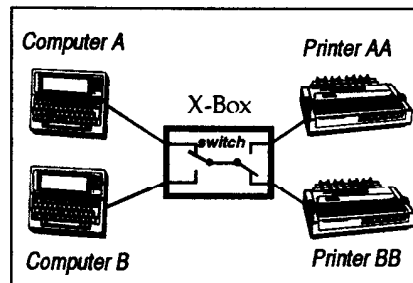


Figure 2. The X-switch lets two computers share two printers.

Since the X-switch has two positions, two of the four paths are active at any one time. In the "standard" position, paths *A-AA* and *B-BB* are active. For me that means that the PC/laser and WP-2/daisywheel are active. The other switch position connects *A-BB* and *B-AA*, "crossing" the connections to make PC/daisywheel and WP-2/laser the active combination.

TUNNEL VISION

I typically use the WP-2 to write lots of

short letters and then print them when I get near a printer. I also use it to write complete, finished documents, and sometimes just first drafts that I export to a PC for finishing.

The WP-2 may display twice the number of characters of the Model 100, but eight lines is still only eight lines. To

Research confirms that the limited screen area can affect your writing style.

get the "big picture" as I work, I frequently print drafts of my work. While it's not good for the health of trees, I've found that editing/printing, editing/printing yields remarkably good writing results. And research confirms that the limited screen area can affect your writing style.

R. John Brockman (see references fol-

Continued on page 32.

USE YOUR DESKTOP COMPUTER AS A DISK DRIVE FOR YOUR M-100.

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Try Disk+ for 30 days. If you aren't as excited as we are, return it for a full refund.

When we designed *Disk+* we did it out of necessity. We wanted a way that we could just connect a Model 100 to our desktop computer with a cable and save files onto the desktop's disk drive. We wanted it to be so simple to use it would be self-explanatory.

Picture this. *Disk+* comes to you on a Snap-in ROM and a diskette for your desktop. You take a quarter and open the little compartment on the back of your Model 100. Then you just press the ROM into the socket. *Disk+* appears on your main menu just like a built-in.

You connect your Model 100 to your other computer using an RS232 cable (available from PCSG for \$40).

You just place the *Disk+* diskette into the desktop's drive and turn on the computer. It powers up automatically and says "awaiting command" on your desktop's screen. Then you just put the widebar cursor on the Model 100 main menu on *Disk+* and press ENTER. You are shown your RAM files arranged just like the main menu.

To save a file to your other system's disk drive, you just move the widebar cursor to the file you want to save and press ENTER. It is saved instantly with no further action.

To look at the disk directory, you just press a function key on your Model 100. You see immediately the disk directory on your Model 100 screen, and it is arranged just like your Model 100's main menu.

To load a file from the diskette to your Model 100, you just move the widebar cursor to the file and press ENTER. The file is transferred to your Model 100's RAM instantly. You can press F8 and go back to the main menu, and the file you loaded from diskette is there, ready to use.

It is so nice to be able to keep your documents, programs (both BASIC and machine code) and *Lucid* spreadsheet files on the diskette, and bring them back when you need them. All files are ready to run or use with no changes or protocol by you.

If you have access to a desktop computer and don't have *Disk+*, then evidently we have done a poor job telling you about it.

All files and programs that you load or save, go over and come back exactly as they are supposed to be because of full error checking. This guaranteed integrity is really a comfort. *Disk+* is wonderful in so many other ways. For example, you can do a "save all" of all your RAM files with just a touch of a function key. That group of files is saved on the diskette under a single filename with a .SD (for subdirectory) extension. Any time you want, you can bring back all those files at once, or just one or two if you like, again with one-button ease.

Disk+ takes up no RAM. That's zero bytes either for storing the program or for operating overhead.

What really excites most *Disk+* users is text file cross compatibility. Your Model 100's text files are usable on your desktop computer, and your desktop's text files become Model 100 text files.

This means you can write something on your Model 100, and with *Disk+* transfer it

instantly to your desktop and start using it right away on your bigger computer. Or the way we like to work is to type in a document on the desktop computer and then transfer it to our Model 100 with *Disk+*. Then we print out the document, beautifully formatted, using WRITE ROM.

Disk+ works with just about every micro sold, from IBM PC and its clones, to all Radio Shack computers (yes, all), to Apple II, Kaypro, Epson and most CPM. Just ask us. More than likely, your computer is supported.

Incidentally, hundreds of Model 100 owners have gone to their Radio Shack stores and bought a color computer because it is so low priced, and with *Disk+* they have an inexpensive disk drive.

And if that weren't enough, how about this: *Disk+* also provides cross-compatibility between different computers like IBM, Apple or the Model 4 using the Model 100 as the intermediary device. Quite a feature!

The snap-in ROM is really great because you can use other ROMs like *Lucid* or WRITE ROM. They snap in and out as easily as an Atari game cartridge and you never lose your files in RAM.

Anyone who ever uses *Disk+* simply can't do without it. But so many times we have had new users call us and say, "Wow! I had no idea when I ordered it that *Disk+* would be so fantastic. I just couldn't believe that I could use my desktop computer's disk drive with my Model 100 just like it is another main menu."

That's why we sell *Disk+* on a thirty-day trial. If you aren't completely satisfied, return it within thirty days for a full refund. Priced at \$149.95 on Snap-in ROM. MasterCard, Visa or COD.

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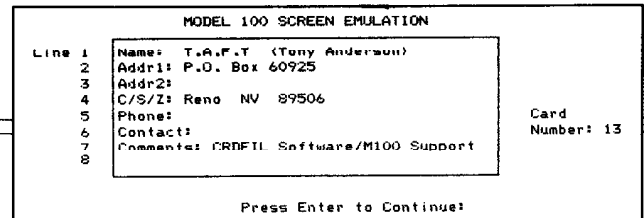
COMPATIBILITY: All MS-DOS computers.

CRDFIL-PC:

*This popular Model 100/102 card file program has grown up—
and can now even team up with your PC!*

CARD DISPLAY MODE

by George Sherman



A typical CRDFIL display on your MS-DOS screen.

I'm taking a slight detour this month from my continuing series of articles on *DeskMate* because of what I consider to be a momentous announcement.

My first article for *Portable 100* over a year ago was a review of my absolute favorite program for the Model 100/102: *CRDFIL.ROM*, a card file type of database system on a ROM chip. ("CRDFIL.ROM: The Review," Oct. '89)

Since then, I've begun to use my PC more and more and used the M100 mostly for *CRDFIL*. Since the files I use daily for my work are in *CRDFIL* format, my M100 was not relegated to the closet, but was in daily use. However, since my desk space was limited, it was not an easy chore to constantly switch machines. Shortly after my P100 review, Tony Anderson, *CRDFIL*'s author, asked if I'd be interested in a PC version of the program. My response was an enthusiastic, "Yes!"

I'm happy to say that *CRDFIL-PC* is now a reality. With some very minor changes the program is essentially a very familiar copy of the M100 version. The transition from one to the other is simplicity personified. The only retraining I had to undergo involved making my choices on the various screens presented. The M100 version let me choose options by number or by a designated letter. The PC version uses only the numeric choice. In writing the PC version, Tony tried to

stick as closely as possible to the M100 version, even to the point of using a visual presentation on the PC's screen of exactly what you see on the M100's screen. Information entered also word-wraps at the border of the presentation exactly as it does on the M100.

The most noticeable difference with the PC version is (of course!) its speed in comparison to the M100. Sorting my famous "humongous file" of 269 cards, each containing six prompts, and weighing in at over 14K bytes, takes minutes,

Files written on either machine may be transferred back and forth

not hours. One of my files, containing 36 cards with five prompts, took four seconds. A second sort of the same file after a card had been added took barely one second.

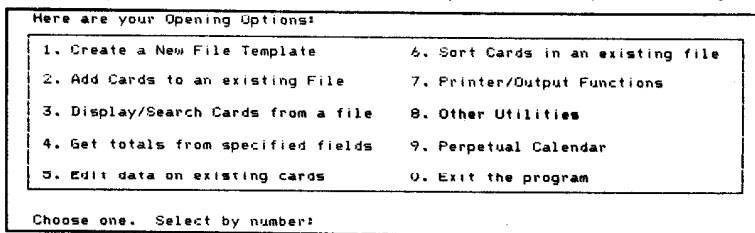
I recently asked Tony what he had in mind for *CRDFIL-PC* now and in the future. He said his purpose in writing the pro-

gram was to give former Model 100/102 users a familiar program in the PC environment to ease their transition as they move up to the PC's. Files written on either machine may be transferred back and forth and used on each with their respective programs.

Consider this scenario: A rather large database in *CRDFIL* format exists in the PC. But a company representative in the field needs a smaller (extracted) subset of the information. Using *CRDFIL-PC*, he extracts a smaller file from the larger file and transfers it to the M100, which he can easily carry. While in the field, the rep makes some changes on some of the cards in the file and adds and subtracts several cards. Returning to his office, he uploads the info to the PC, adds the two files together, and edits the end result to produce an up-to-date office record.

More and more businesses are becoming PC-oriented, and this will allow continued use of the M100/102 as a movable database tool—away from the PC—which stores the main database in *CRDFIL* format.

What's in the future for *CRDFIL*? Tony's next project is to make *CRDFIL* available in a strictly PC-based form, which wouldn't be directly compatible with the M100 platform (because of differences in screen handling), yet make the data "port-able" so files can be extracted and used in the M100/102's in the original form. Tony envisions four general formats arising from this approach: First, a 3x5-inch file card form, which equates to 17 lines of printing, each line up to 60 characters long, that will display fine on the PC screen. Second, a 4x6-inch



The opening menu display of CRDFIL.

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file card form, equating to 23 lines of up to 72 characters. Third, a freeform "card" that would be a full screen, 24 lines by 80 characters. Fourth, a "Rolodex" format, 8 lines by about 48 characters. The 3x5-inch, 4x6-inch, and Rolodex formats would relate to the stock continuous form cards available on the market (i.e., they'd be "standardized" to work with those sizes of card stock). These will be quite similar to the formats provided in the *PRINT* section of the existing version, in which the mentioned styles are already set up, including screen displays.

Tony is also considering the possibility of an additional size called "tickler," or 2.5x3 inches, which is essentially a 3x5 card cut in half, roughly the size of a business card. This can be used by executives, salesmen, etc., as a card-based "to-do" file they can carry in their wallets or pocket secretaries. Its main value would be in the reminder, schedule, or projects types of applications, since there is so little that can one can put on such a card.

CRDFIL wasn't intended to compete with what are known as "relational" database systems, which in most instances are far more complex and more capable than is *CRDFIL*. It was designed to be a simple card file replacement system—an electronic card file system, if you will.

When I moved up to the PC, I searched for a filing system that would do for me what I had come to expect of *CRDFIL*. I tried several programs out. None did for me what I wanted. Each did some of the things *CRDFIL* did, and in many instances better. But none did all that *CRDFIL* did. Several I looked at were so complicated that I dismissed them out of hand. I finally settled on one and tried to transfer my information over from the "humongous *crdfil*" to the new format. After days of typing, I thought, "Finally, I can now use a PC based system which will replace *CRDFIL*." I was wrong. In that particular program each item *had* to have a part number for the program to work. In my stockroom, many of the items carried, such as tools, etc., had no part numbers. *CRDFIL* had let me work my cards with or without a particular field's completion. The new program would not. You know what I did? I dumped the new program and went back to the M100 and *CRDFIL*.

CRDFIL-PC is available on 3.5-inch or 5.25-inch disks, and may be used directly from the disk or placed in its own subdirectory on a hard-disk system, which can also contain your own data files. To run it, simply type *CRDFIL* at the DOS prompt. It can also be executed by many popular menu programs. As in the M100 version, an extensive menu system within *CRDFIL-PC* guides you step-by-step through the program.

CRDFIL-PC is priced at \$24.95, postpaid, and comes with helpful instructions in a disk-based manual. It assumes you are

already familiar with the M100/102 version. There will be a \$5.00 credit to previous purchasers of the *CRDFIL.ROM*, and it will be offered as an added option to future M100/102 version buyers. Order from T.A.F.T., P.O. Box 60925, Reno, NV 89506.

BY GEORGE!

PRODUCT SPECIFICATIONS & SUPPLIERS

CRDFIL-PC—\$24.95

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Other Model 100/102 versions are available for use with Tandy Disk/Video Interface, EME Systems' extRAM, and Purple Computing's Booster Pak.

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Using only 6.5K of RAM, *StayAround* can support up to 16 applications at the same time. Switching between the applications requires a simple, user-defined two-stroke hot-key combination to call up *StayAround's* main menu, where they select a suspended application.

StayAround supports all DOS-based computers, including portables. It requires a 20MB hard disk and DOS 3.x. It retails for only \$59.95. For more information, contact North Shore Systems, Inc., P.O. Box 8366, La Crescenta, CA 91214, (818) 248-1711. Or circle #60 on your Reader Service Card.

Link Your Mac To Your Model 100/102

The Tandy Model 100/102 computers along with *100duet* from Cabochon can be the most cost-effective additions you can make to your Macintosh. With the Model 102 you can carry a keyboard almost anywhere you go. The Model 102 makes it easy to take notes or work on assignments away from your Macintosh. *100duet* makes it easy to load your work into the Macintosh for use with your favorite word processor. And you can copy files back to the portable for in-field revisions!

The hardware cable has a DB-9 and a Mini-8 connector for connecting to both the older 512K and 512KE Macs as well as the newer models. The software is easy to



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TENKY+, *TYPE+*, *DATA+*), and will continue to provide custom ROM products for corporate, industrial, law enforcement, educational, and other specialized applications.

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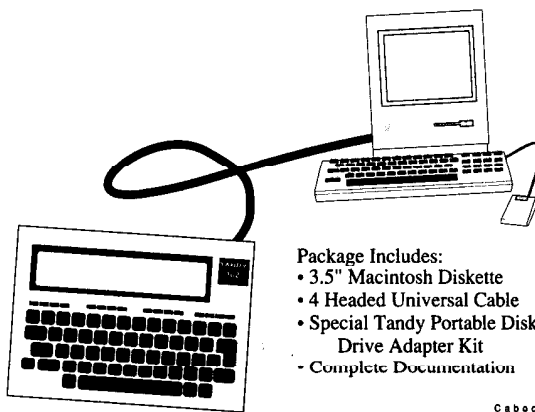
In celebration of this event, TMN

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COMPATIBILITY: All MS-DOS computers.

Moving Up: Chapter Two

*Specifics on MS-DOS,
and some starter shareware*

by Tony B. Anderson

Picking up our train of thought from last month's article ... The PC, through its base operating system, MS-DOS, is a disk-based system, unlike the Model 100 family, which is a RAM-based system. Rather than having several programs and files in RAM, selecting those you want to use, programs and files are stored on disk and loaded into RAM in order to work or use, one at a time. Except that MS-DOS allows a number of programs to actually be loaded into RAM at the same time, each performing its own tasks as needed, generally without conflicts with other programs that are also loaded. Such programs are called "TSR" (Terminate and Stay Resident) programs. They can be loaded, installed and exited, remaining resident and active as you need them. Additional programs can be loaded on top of them

```
DEVICE=RAMDISK.SYS
DEVICE=ANSI.SYS
FILES=20
BUFFERS=20
```

Figure 1. At bootup time, this typical CONFIG.SYS file installs a RAMdisk, installs the ANSI.SYS driver to configure the screen and keyboard, and reserves space for file buffers.

(higher in memory)—given that additional RAM space is available—and some of these may also be TSR's. They can be thought of as being similar to disk operating systems (DOS'es) for the various disk drives available to the Model 100 family. They are loaded and become resident programs which can be accessed or entered as needed, often invisibly, or with a couple of keystrokes.

The MS-DOS operating system is capable of handling multiple TSR's without conflict, depending on available space and lack of inherent conflicts, of

course. Such programs, generally operating invisibly, become part of the operating system itself, and in fact "configure" the PC into almost any custom setup the user might want or need.

Loading a mouse controller TSR, for example, configures the computer to support the mouse. Loading a printer driver TSR configures the computer to support a specific printer or range of printers.

The first thing we notice when we turn on a PC is that it isn't immediately ready to use like the Model 100 family is, except in a few cases where the PC is designed around ROM-based software. In most cases, the PC has to go through several steps to get ready for use, often called the "booting up" process. This is the process of loading and installing the various TSR's that customize the user's configuration.

First, the PC goes through certain preliminary checks: checking available RAM space; doing self-test diagnostics; loading the calendar and clock values into memory if a hardware clock is installed; and finally, loading the software and programs that configure the computer into a usable machine.

This process takes between 45 seconds and a minute or so, and unless you have a menu program or integrated software package that comes up as the first application, the system takes you to the DOS prompt, which indicates the default disk drive, or other parameters you can customize, and waits for you to enter a command—to tell it what to do next.

At the DOS prompt you can type a command to run a program or to perform specific actions allowed by the command interpreter. To view the directory of the default drive, for example, you would type *DIR* and press the *ENTER* key. MS-DOS responds by scrolling

a list of all the files, programs, or data that are contained in the default directory. By adding */P* or */W* to the *DIR* command, you can "page" the display, stopping after each increment of 23 files, allowing you time to read the list, or list only the file names in five columns across the screen. Pressing *ENTER* again goes on to the next group of file names.

```
ECHO OFF
PROMPT SP$G
PATH=D:\; C:\; C:\UTILITY; C:\MENU;
GRAPHICS STANDARD
BREAK=ON
MENU
```

Figure 2. After CONFIG.SYS has done its job at bootup time, this typical AUTOEXEC.BAT file automatically runs (passing commands to the computer as though you'd typed these lines yourself). It sets the DOS prompt to be displayed, the search path for programs, a couple of other parameters, and then runs a program called MENU.

There are three types of programs that will run directly in a PC, not including BASIC programs, which run under the BASIC interpreter, variously called BASIC, BASICA, or GW-BASIC, depending on the exact version provided for your PC.

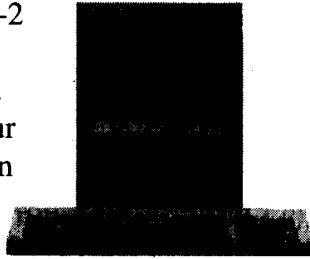
The first type of program is identified by the file name extension *.EXE*. This is an executable program that runs in the PC's native language. It can be any form of assembly language or compiled source code, which runs in the PC as assembly language. *.EXE* programs are generally larger than 64K in size.

The second type is identified by the file name extension *.COM*. This is virtually the same as an *.EXE* program, except that it is generally smaller than 64K in size. TSR's are usually *.COM* programs. *COM* is generally interpreted to mean a *COM*mand program.

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The third type isn't actually a program, but a group of plain language statements that can cause certain actions to be taken, or certain programs to be run in a specified order. It is identified by the file name extension .BAT, which stands for BATCH file. It is a plain ASCII text file that contains statements or commands that are acted upon by the computer, as if they had been typed at the keyboard one at a time.

The above types of programs are run by simply typing their name and pressing the ENTER key when you are at the DOS prompt. It's not necessary to include the filename extension unless you have more than one program form in a directory; programs with the same name but different extensions, like MENU.EXE, MENU.COM, and MENU.BAT. The program doesn't actually have to be in the default disk directory, as long as it is in the search path, discussed a little later in this article. The "default directory" is the one that is indicated by the DOS prompt, and except for the search path, contains the programs and files you can use "by default"—by simply typing their names. If the program is not in the default directory or the path, you have to include a path specification, to tell the computer where to find the program. (More on that next month.)

Batch files are very useful in automat-

ing many activities in the computer. In fact, the booting up process, when you turn the computer on, is actually a batch process, controlled first by the BIOS ROM, then by two special files in the directory of your system disk.

The BIOS ROM, after performing the various self-tests, loads the operating system programs, called the system files. The first two are the IBMBIO.COM and IBMDOS.COM. This is followed by COMMAND.COM, which is the MS-DOS command interpreter.

The third type isn't actually a program.

CONFIGURING THE SYSTEM

After the three system files are loaded, control passes to a file called CONFIG.SYS, which loads the specified configuration TSR programs. These are the most basic elements that determine how your machine will work. They form part of the computer's operating system.

Eventually, you will use your text editor or word processing program to

customize the CONFIG.SYS file to suit your own needs. Most likely, your computer came from the factory with a very basic configuration setup. Later on, you will be able to add a lot of additional features by changing the CONFIG.SYS file.

The most basic recommended configuration is listed in Figure 1 which accompanies this article. If you don't yet have a text editor or word processor working, you can probably get started with the standard version that came as part of the initialization package with your computer.

RAMDISK.SYS is a program that creates a 128K RAMdisk in the Tandy 1400. Other models may have programs that do the same thing, but are called by a different name; check your manual.

ANSI.SYS configures your software so that some programs which use control characters for moving the cursor or locating text on the screen will operate properly. It is also useful with some graphics display programs. This configuration is optional, but speeds up screen display in programs that use direct screen access. If you don't already have it installed, such programs will usually stop and ask you to load it manually. It doesn't affect anything else if you have it loaded and your programs don't need it, so you might as well load it

automatically.

FILES and *BUFFERS* preset and reserve space for file and device access. 20 is a more-or-less standard amount; some applications may require more. The vast majority of applications will run with 20 as the initial configuration.

AUTOEXEC.BAT

Once the configuration TSR's are loaded, MS-DOS looks for a batch file called *AUTOEXEC.BAT*, which loads additional TSR programs and drivers, or defines various aspects of the system. Figure 2 is a typical example.

ECHO OFF prevents screen display of each command from the *AUTOEXEC* file as it is typed to the screen.

PROMPT \$P\$G tells the computer what prompt to display as the "DOS prompt," the one you see when you're at the command line and can type commands. The dollar sign, followed by a letter, sets up a particular prompt display. You can look up what options are available in your DOS manual, and choose those that suit your own taste. *\$P\$G* causes the DOS prompt to tell you what disk directory or subdirectory you are in at any given time—valuable information for new users.

PATH = sets the system "path," the path that MS-DOS will follow in looking for programs you tell it to run. In the particular path setting shown, MS-DOS will first look for a program in drive D, the Tandy 1400's 128K RAMdisk. (Obviously, if you aren't using a RAMdisk that is defined as drive D, you wouldn't need the *D:* parameter.) If the requested program is not found, the system will next look in the root directory of drive C (*C:*), and if not found there, it will then look in a subdirectory on drive C called *UTILITY*. Finally, it will look in the subdirectory called *MENU*. If the file is not found anywhere along the path, MS-DOS will report a *File not found* error. The path can be extended or changed to suit each user's individual situation or needs.

GRAPHICS STANDARD invokes a screen dump program that will allow you to dump the screen, including graphics, to a "standard" printer. There are various options, depending on your particular type of printer. Check your MS-DOS manual for details or different options.

BREAK=ON enables the *CONTROL-BREAK* key, which can be used to stop a running program, similar to *CTRL-C* or *SHIFT-BREAK* on the Model 100. If you do not include this command, many programs cannot be stopped until they end naturally. In some programs, it is necessary to press *CTRL-BREAK*, fol-

Recommended additional reading...

Most Tandy computers come with manuals which are basic guides to use of the machine. Unfortunately, they are often sketchy when it comes to covering the subject matter in any depth. The following books are recommended reading for new users of MS-DOS systems.

1. *DOS Made Easy*, by Herbert Schildt. Published by Osborne/McGraw-Hill; \$19.95. A good, general purpose book that explains most of the MS-DOS features, along with options, command syntax, and usage, in non-technical terms.
2. *Tandy 1000 MS-DOS Reference Manual*, Radio Shack Catalog number 25-1508. A two-volume set, the second volume covers GW-BASIC (you'll want the BASIC manual when we get into BASIC programming later in this series). Listed in the general catalog at

\$29.95, it is often available at \$19.95, and occasionally as low as \$9.95 on a sale.

3. *MS-DOS, The Basics*, by David A. Lien. Radio Shack Catalog number 25-1506. The third edition of this manual is listed in the general catalog at \$7.95, and is a good introductory manual to MS-DOS written in Dr. Lien's popular, easy to read and understand style. While it seems specific to the Tandy 1000 and 3000 series of computers, it contains a great deal of generic information that is also applicable to the Tandy laptops, and is written at a basic, introductory level. This volume is identified as Volume 1. For more advanced users, there is a Volume 2, *MS-DOS: Advanced Applications*, Radio Shack Catalog number 25-1507, priced at \$14.95.

lowed by *CTRL-C* in order to stop the program.

MENU assumes that you use some sort of menuing program. This command will cause the menu program to run if it is named *MENU.EXE*, *MENU.COM*, or *MENU.BAT*. We'll discuss menuing programs in a later article—they're an important concept in making the PC as easy to use as a Model 100. If you don't use a menu program, or want some other program to be run, just place its name as the last entry in the *AUTOEXEC.BAT* file. Control of the computer is effectively handed over to the last program named in the file. It's the equivalent of a "chain" or "run" command. It just runs the program, the same as if you had typed the program name at the DOS prompt. Normally, if you list several program names in a batch file, as each program ends, it will return to the batch file and run the next program, or perform the next action defined in the file. That is one of the features that makes batch files so useful, you can run several related tasks by running the batch file, which handles everything for you.

THIS MONTH'S SHAREWARE DISK

The shareware offering this month, two programs, are based on the most basic need of new PC users: help in understanding MS-DOS and its cryptic, often unintelligible command structure.

HELPME.EXE is a program you install in your system's path, so you can get to it from the DOS prompt. Simply type

HELPME (and press the *ENTER* key, of course), and the program will present a menu list of the most common MS-DOS commands. You select the command you want additional information on by moving the cursor over the name of the command and pressing the *ENTER* key. The program will pop up a window that describes the command syntax, the basic function, and lists various options.

DOSHELP.EXE is a more complete list of the MS-DOS commands, including many of the more obscure ones, which gives you an almost complete manual description of the function. You have virtually the entire MS-DOS manual available at any time you need help.

Both programs can be stored in your system path, or left on the distribution disk for use when needed. Specify PC Shareware Disk #1 when ordering, and indicate 3.5-inch or 5.25-inch disk. \$6.00 includes shipping charges.

COMING ATTRACTIONS

Next month: Dealing with the disk system, file compression and archiving utilities.

Tony Anderson, a sysop on CompuServe's Model 100 Forum for six years, is a frequent contributor of articles and programs to the Forum, and also develops and sells commercial software for the Model 100 family, including the popular CRDFIL database. He'll be happy to answer questions sent to him via CompuServe's MAIL facility (send to 76703, 4062), or by postal mail at P.O. Box 60925, Reno, NV 89506 (please include SASE if requesting a reply).



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Further, LUCID[®] has what no other spreadsheet has: Cut, Copy, and Paste. It uses the same keys as Cut and Paste in TEXT, but here's the difference: it takes all the formulas with it when you paste and they all automatically recalculate with the entire sheet.

And here is what is really amazing. You can copy or cut from one spreadsheet and paste into another spreadsheet or even a TEXT file.

LUCID[®] supports all BASIC math functions as well as Log, sine, cosine, tangent, exponentiation and other sophisticated math functions.

LUCID[®] has so many features that you will say "this is what I need in a spreadsheet", such as automatic prompting of an incorrectly typed-in formula showing just where the mistake was made.

LUCID[®] has expanded "go to" functions that remember and produce a windowing capability.

But perhaps most remarkable is that LUCID[®] is not only a spreadsheet but a program generator as well. First, LUCID[®] lets you protect all cells against entry or change, and then unprotect just the cells you want for someone else to use as input fields.

LUCID[®] will not only process values, but text input as well so that the facts other than numbers can be responded to. LUCID[®] has the ability for you to refer in a formula to cells containing words. This feature combines with the capacity of doing "if then" statements that work by doing table look-ups against even massive X/Y charts of text or numerical information. You can produce a program that responds to inputs with no programming knowledge whatsoever.

You can prepare a report section in your spreadsheet with instructions to your user for printout, and they can produce a personalized printout that responds to their input. All your formulas and tables that did the calculations and provided the facts are invisible to that user. LUCID[®] is useful for doctors for patient questionnaires, troubleshooting technicians, purchase clerks, people doing job quotes, stores for customer workups, insurance agents and anybody who needs to process specific facts and numbers to produce a report based on those responses.

LUCID[®] comes with a manual that explains not only the characteristics of LUCID[®], but will train you how to use a spreadsheet even if you have never seen one before. You are shown how to do budgets, forecasts, breakeven analysis amortizations and many other types of personal and business reports and calculations.

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easier and faster to use."

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Continued on page 23.

lowing article) writes that editing on a regular PC screen cannot give you the sense of "flow" of your document. You are artificially constrained to a 24-line viewport of your documents. While you can scroll up and down, you can only see 24 lines at a time. You need to be able to step back and see the "big picture." With the WP-2's 8-line screen this problem is even more acute.

He quotes research which suggests that the "linearity of scrolling focuses attention to the local [sentence level] problems rather than with more global [organizational, audience] level problems."

Says Brockman, "We need to correct and revise from a much larger perspective. Long-term memory alone cannot make up for the portions of the copy that aren't visually present." My edit/print cycle on the WP-2 seems to confirm his findings.

Another important technique I use is just to write. When I get a thought (a rare occurrence), I just add a new paragraph wherever I happen to be. Because of the WP-2's limited viewport onto my document, it's hard to remember exactly where the thought goes. But during the next print cycle it's easy to see where it should go.

THE IN-BOX

This is *your* column. I want you to help define the "yellow brick road" for me to follow. Fire up your WP-2 and send me a letter in care of *Portable 100* or directly at P.O. Box 28181, Santa Ana, CA 92799-8181. If you prefer the electronic medium, use GEnie address STAN.WONG, CompuServe address 70346,1267, or Internet address dasun!wongs@Sunkist.West.Sun.Com.

Oh, one last item: Yes, I did write this entire column on my WP-2. Not a single byte was sullied by the likes of a PC or Mac. Not bad for a "wordprocessor," huh? So until next time, don't forget to write! (Pun intended.)

References for further reading:

1. Brockman, R. John. *Writing Better Computer User Documentation*, Wiley, 1990, p. 239.
2. Nugent, Mike. "The WP-2 Portable Wordprocessor," *Portable 100*, November 1989, p. 8.
3. Wong, Stan. "Whoops and Auntie Em: A Tale of Two Computers," *Portable 100*, May 1990, p. 20.
4. Grotta, Daniel. "Adding Memory to Your Tandy WP-2," *Portable 100*, March 1990, p. 20.
5. Daigle, Michael. "They Laughed When I Sat Down to Word Process," *Portable 100*, December 1990, p. 10.
6. Wilburn, Gene. "TWPKIT for The WP-2," *Portable 100*, March 1991, p. 10.

ments to Define Bytes or Define Words (word = 2 bytes). This is a common way for one part of a program to pass a value to a subroutine, for example:

```
main: sta value1
      shld value2
      call sub1
      .
      .
sub1: lda value1
      lhld value2
      .
      .
      ret

value1: db 0
value2: dw 00
```

In the above listing, the main program stores A and HL in the data storage areas, *value1* and *value2*. Then a subroutine that needs those values will get them from the storage area, and use them as needed.

Now consider this alternative:

```
main: sta sub1+1
      shld v2+1
      call sub1
      .
      .
sub1: mvi a,0
```

```
v2: lxi h,0
    .
    .
    ret
```

Note that the main program stores the A and HL values directly into the operand and address of the instruction designed to retrieve those values. This eliminates the need to allocate space for the variables, and an "immediate" instruction (MVI and LXI) executes much faster than its "reference" counterpart (LDA and LHLD). You save bytes and have a faster running program!

I've been using these programming techniques for some time now, and I'm sure they will be useful to the experienced (as well as the novice) assembly language programmer.

Paul can be reached by modem on CompuServe (72227,1661) and GEnie (P.GLOBMAN), or by mail at 9406 N.W. 48th St., Sunrise, FL 33351 (please enclose SASE if you're requesting a reply).



COMPATIBILITY: Model 100, 102, 200, NEC 8201/8300, Kyocera KC-85, Olivetti M10.

Joyriding in the Model T: Tandy's "classic" lives!

*Portable 100 welcomes beginners and old-timers alike to
"Mr. Wilburn's Neighborhood."*

by Gene Wilburn

The Tandy Model 100/102 (M100 for short) is, quite simply, the neatest little computer that ever hit the streets. Unlike "appliance computers," such as the Tandy WP-2, the M100 has panache. It's a classic.

Michael Daigle has dubbed the M100 the "Model T," evoking images of that venerable earlier technology that likewise had a profound impact on our lives. Thanks, Michael. I'm going to borrow your delightful coinage to cover the Tandy 100/102, its younger, heftier brother, the Tandy 200, as well as its cousins, the NEC 8201/8300, Kyocera KC-85, and Olivetti M10.

Since its introduction in 1983, people have been smitten with the amazing capabilities of this inexpensive, totally portable, nifty little do-everything machine. You can write with it, maintain schedules with it, play games on it, connect to remote systems with it, and program it. With its native 32K RAM space, text processor, scheduling and address modules, built-in 300 bps modem, plus a really useful implementation of Microsoft interpreted BASIC, the M100 was a self-contained, ready-to-use computer, right out of the box.

And didn't it catch on! During its heyday it seemed every journalist in North America used one. I still remember watching a World Series game where the TV camera panned the press box, revealing dozens of M100's lined up across the tables like jets on a carrier deck.

One of the selling points of the M100 was that you didn't have to be a rocket scientist to use the thing. It was the kind of computer you could buy for your aunt or uncle. Even Jerry Pournelle of *Byte* magazine used a Model T. The operating system interface was so simple that nobody was intimidated by it—

simply turned on the computer, highlighted what you wanted with the cursor bar, and pressed ENTER. It was the world's first, and maybe only, user-cud-dly micro.

The M100 caught the fancy of home users, hobbyists, programmers, executives, and even DP professionals. A flourishing CompuServe forum, the M100SIG, was established to provide a meeting place for enthusiasts and assistance for new users, and magazines like *PICO* and *Portable 100* were founded to support users of the M100 family.

People began writing programs for the M100 by the hundreds, then by the thousands. Many of these programs

occurred the moment I first saw one in a Radio Shack store in 1983. I grabbed my credit card and bought on the spot. It looked like an ideal match for my freelance writing, and it was. I've pumped over 150,000 words through the thing.

In my day job (computer systems), I convinced my employer to purchase a small fleet of M100's. They were used for everything from data collection for a mainframe to word processing. It was common to walk down the hall and see two or three M100's stacked up at the secretaries' desks with yellow Post-it's attached telling which files to transfer into the corporate IBM Displaywriters. The M100's looked like tugboats nuzzling up to a supertanker. (Poetic justice: the Displaywriters are long gone, but the M100's live on.)

Okay, you say, that was the 80's and this is the 90's. Where does the M100 fit in 1991?

To be honest, the M100's are not the hot items they once were, though, thankfully, the T102 is still in the Radio Shack catalog. Many journalists have switched to portable MS-DOS computers and most programmers and hobbyists have Macs or PC's on their desks. No one would argue that the M100's low-contrast, limited-display LCD screen, its small RAM space, or its slow processor is state-of-the-art. The current crop of 286 and 386SX DOS notebooks run rings around the M100's (and so does the price, natch).

Despite all that, the M100 holds its own. The reason: It's an inexpensive, interesting, open-ended computer, and just like the Model T automobile, it's still fun to take out on the road.

It has staying power. My TRS-80 Models I and III are history, as are my

**... M100's lined up
across the tables
like jets
on a carrier deck.**

began to collect on BBS's and in the CompuServe M100SIG libraries. Third-party hardware and software vendors developed M100 products of enormous ingenuity and practical usefulness.

Some owners used their M100's as adjuncts to their desktop systems. For others, their M100 was their sole computer. It provided them with everything they wanted or needed.

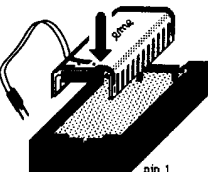
My own involvement with the M100



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extRAM is a 32K byte read/write memory expansion that fits into your Tandy's internal option ROM socket.

extRAM fits into the option ROM socket in the 100/102/200. A quick 2-pin plug connects extRAM to battery and WR lines, all under the snap-on cover. Easy to install.



There are two ways to use extRAM: (It's one or the other at any one time.)

As a **RAM-file-bank**, you double your space for .DO, .BA and .CO files. You store reports, data and programs you aren't currently working on out of the way in the extRAM and call them back instantly when you need them. Our improved file-bank software hides in the extRAM itself, so it uses minimal RAM and it is "cold boot" proof too. It also now includes extensions to BASIC for reading and transferring individual text files. Adapted from original software, *SLX* and *EXTBAS*, © 1989 by Paul Globman.

As a **ROM-file-bank**, or **emulator**, you can load extRAM with the kind of software that normally resides on option ROM chips. But no more physical chip swapping! You swap in new ROM *images* on command, from files stored on disk or RS232. Great for users of more than one ROM and for ROM developers. Loads 32K image in 40 seconds. Works with most ROM software. Software R2D2X © 1990 by Wilson Van Alst.

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MODEL T JOYRIDE

Apple II and Osborne I. My original IBM PC's have been replaced with 286's and 386's, and along the way I added a Mac SE and a Tandy WP-2. But in all my buying and selling, I never once considered selling my M100. It might be slower than I'd like and, admittedly, not as easy to view as I'd like, but the little sucker still packs a punch!

There's never been a true replacement for it. The WP-2 has its own virtues, but while I like its smaller size, lighter weight, and 80-column display. I can't write a program with the thing and its *TELCOM* program appears to have taken a direct hit from a design Scud. Because the M100's have no logical successors, people just keep on using them.

And that's what this column—**MODEL T JOYRIDE**—is going to be about: using, and enjoying, the Model T family—100's, 102's, 200's, and clones. For the sake of brevity, I will use the terms *M100* and *Model T* to include, generically, all of these models. I'll use the designators *M100*, *T102*, *T200*, and *NEC PC8201A/8300*, etc., when I need to distinguish between them.

There's an entire generation of Model T owners out there who missed the early years of excitement and who aren't familiar with the pioneering and loving work that has left a legacy of thousands of ingenious M100 programs and dozens of almost indecently clever hardware widgets that can give your Model T wings. (So what's an occasional mixed metaphor among friends?)

Whether you inherited your M100 as a hand-me-down from an older sibling, found one at a garage sale, bought one from a neighbor, or purchased one directly from Tandy, you'll be pleased to know that there are thousands of M100 owners across North America—more than 500,000 of them, with more coming aboard every day. With numbers like that, what we've got here is a potential electronic Woodstock. Imagine for a moment a picnic in upstate New York with over half a million Mod 100 owners sitting on the hillside eating hot dogs, drinking beer, and calculating mortgages. Awesome!

The **JOYRIDE** column will begin with the basics—an orientation to the M100 as it comes out of the box. We'll look at how to use the built-in programs effectively, how to connect an M100 to a Mac or PC, how to back up files to cassette, disk, or another computer, and how to use the built-in modem.

Next we'll branch out to hardware enhancements—RAM expansion and those amazing ROM's that are still available (and some new ones to come!). We'll

look at some of the new programs being written for the M100, and we'll dig out some of the classics. We'll explore the use of the built-in modem and explain how to connect to a BBS, or to CompuServe, or to GENie.

We'll look at the ways the M100 can be used either by itself, or in conjunction with a desktop computer, as a productivity tool for such things as writing, idea generating, checkbook balancing, invoicing, scheduling, or learning French.

We'll even take a gentle tour of M100 BASIC. Who knows, you may discover there's a latent programmer in you waiting to emerge.

Last, but not least, we'll explore everyone's favorite topic: cables.

Above all, this column is about the fun of using an M100, with tips on how to

**With numbers like
that, what we've
got here is a
potential
electronic
Woodstock.**

use it more productively. We welcome all of you M100 veterans, too, but don't expect to find any ROM calls here. This is a beginner's column, second time around, for those who are using the M100 first time around.

If you've got suggestions or questions, please send them along. If you've got interesting stories about how you use your M100, send those along, too. Let's stock up on penlight batteries and give the old Model T a spin!

You can communicate with Gene via CompuServe (his ID is 72435,732), through regular mail via the Portable 100 magazine address, or direct: 91 Inglewood Drive, Mississauga, Ontario, Canada L5G 1X9 (be sure to include sufficient postage if you mail to Canada.) Please enclose an SASE when requesting a reply.



The Portable 100 Classifieds

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also customize 5 *BASIC* programs. \$49.00+\$2.00 (S&H). Software by Stefens', 1731 William Ct., Little Chute, WI 54140.

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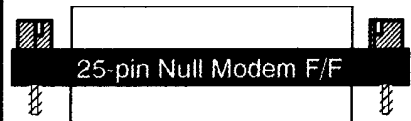
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ROM WITH A VIEW ADVERTISER'S INDEX

Continued from page 3.

our buns; please do your part. Support our advertisers. Tell non-advertisers why you didn't buy from them. And stop giving your P100's to your buddy! It hurts us all in the long run. Make him get his own sub. I don't even give my friend John freebies. (Maybe that's why he doesn't think I'm funny anymore?) Whatever ... take an active role, and we can do all these things and more! Thank!

One last item. To you servicemen and women returning from the Persian Gulf, some of whom are members of the P100 family of readers: WELCOME HOME! We're glad you're back! To those still abroad: We hope you'll come home soon! And to all of you: May your future troubles be no more serious than an occasional cold start.

(John probably thinks cold starts are funny.)

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1985

January: DG has the One to Go, *Model 100 Proves Itself in the Jungles of Nicaragua*, Meet the Dulmont Magnum, *Telecommuter: Software that's Ingenious*, *Kyocera's Three Aces*. End Telephone Tag with M100's.

February: NEC Wishing upon Its Starlet, In-Depth Reviews of HP 110, Sharp PC-5000, *Chattanooga Systems AutoPen, AutoPad, Trip*.

March: Reviews of Epson Geneva and Osborne 3, Comparisons of Two Thermal Printers (Brother HR-5 and Printex TH-160); *The Pluses and Minuses of Batteries, M100 Data Acquisition*.

April: Reviews of Sord IS-11, Sharp PC-1350, *DISK+*, *T-BASE*, and Roadrunner; *Free Software: Textpro*, Technology Transfer Damming the PICO Pipeline to Russia.

May: Review of DG1, Which Spreadsheet Should you Buy? Servicing Picos, LCD Screens in Color, Federal Express.

June: Reviews of Tandy 200, *2.2 Companion*, and *T-Backup*, *M100 File Transfer*, Wrangler improves the Odde with Sharp PC-5000s, Dow Jones News/Retrieval On-line Database, *Courier M100's*.

August: Reviews of Datavue 25 and *Touchbase Modem*; QuickTrip Convenience Stores More Efficient, Tracing Tribal Roots and Translating the Bible in Jungles of Papua New Guinea.

September: Reviews of HP Portable Plus, *WriteROM*, *ThinWrite 80 Portable Printer*, A Flat Mac, *M100 Meets Challenges at Woods Hole Oceanographic Institute*.

October: Reviews of Kaypro 2000, *T-View 80*; Computerized Fire Department, Stretching the limits of Telephone and Computer, *BASIC translation Tactics*.

November: Reviews of Bondwell 2, NEC 8027A Printer, *CQ Haste*; *PICO Formatter*, Search and Rescue Via Computers, Industry Views from an HP Exec.

December: Close Look at Ericsson Portable and *TMPC (time management software)*, Travel Tips, Tricks for Traveling, *Dialer Program*, *Project management with the M100*.

1986

January: Reviews of Gridcase 2, Access, Word-Finder, and Prospecting, CP/M and MS-DOS, *Security Program*, Can Universities Cope with Picos? News from Comdex, *Jazz up your LCD*.

February: Reviews of ZP-150, and LeScript Word Processing; *Stevie Wonder Inspires Stardom in M100*, Can Universities Meet Expectations of

Computer-literate Students? *Cold-Start recovery, Personalized Form Letters*.

March: Reviews of Panasonic Exec. Partner, Lync 5.0, and *Hardwire*; University Rethinks its Tasks, Picos in Medicine, *Auxiliary Battery Packs Spell Independence, More Muscle for the M100*.

May: Reviews of Toshiba T1100, IBM PC Convertible, Casion FX-7000G Calculator, SG-10 Printer; *MIKEY, Appointment Manager*, and *FAST*, IRS Crowns Zenith's Z-171, Handhelds in Restaurants.

June: Reviews of Zenith Z-171, *LapCoder, SuperROM, LAPDOS, and BlackJack*; Go Shopping at PC in Rochester, NY, OM10 RAM Map (pt 1), A Tale of Two City Councils.

July: Reviews of Bondwell, ROM2, Letterjet HS-80, and Sidestar; Electronic Cottage, Taking Stock of Investment databases II, NEC 8201A's LCD, OM10 RAM Map (pt 2)..

August: NH's Governor discusses Laptops, PC-7000 from Sharp, Choosing your test-oriented Database manager, *Model 100/200's Lend a hand to Job Seekers*, NEC-8201A's Communication Connection.

October: Reviews of Toshiba 1100+, New Word, *Diconix Printers*, Fortune 500 Picos. Interview with DG Exec's, Desktop publishing with Picos.

November: Picos in Libraries, *Clever M100 Combinations, Exploring TPDD Part I*, Reviews of Datacomputer 2.0, *TPDD, TS-DOS*.

December: Picos on Wall Street, Connecting to On-line Databases, Telephone Problems, *TPDD Part II*, Reviews of *Cleuseau, French/German Tutor 3, Pocketsize Modems: 1986 Article Index*.

1987

January: Book Publishing With a Pico, *Framework in a Pico*, Review of Right-Writer, JK Lasser's Money Manager, HP+Enhanced, Electric Webster, *Disk Power*, Pico's Computer Buyer Guide.

February: *Poor Man's Idea Processor*, Macintosh-Pico Connection, *M100 Cursor key alteration*, Handhelds: HP-18C, Langenscheidt 8000, TI-74, Reviews of Sord IS11-C, *Lets Play Monopoly, \$100 letter quality printer*.

April: Browsing the Boards, Writers & Portables, KTI products, Badminton & NEC, Reviews of *Inside the M100, TTXPress Printer, PCSG Business Analyst*, Datapad 84 Zoomracks & ECFS.

May: Doctors with Portables, *Text to printer*, Hitting the Board **OUT** of PC Convertible Add-ons, Holiday **OUT** & Shout, *M100 memory Expansion*.

June: Lawyers & Laptops, *Personal Management System, M100/Mainframe Terminal Prog.*, Reviews of Wang Portable, *Search, Sprint and Supercalculator*, *Best of Compuserve book*, Chess-to-go.

July: Programming in the Portable Environment, Synop interview, Talking portables (pt1), Portable Computer Buyer Guide, Reviews of *TS-Random*, Software Carosel, Popcorn & the Hyperion.

August: NEC 8201 tokens, Laptops in Movie filming, Talking Port **OUT** Reviews of Casio FX-8000G, Tandy 1400LT, and *System 100*.

September: *English Teachers use Laptops, Picos in Class*, **OUT** *plates, Picos in the Oil Patch*, Reviews of *ColorPro*, and the *Sportster 1200 modem*.

November: *Control That Printer, Academia & Laptops*, Laptops on Capital Hill, *Starlet Secrets*, Reviews of Psion II, *DVORAK keyboard*, & Spark.

December: Global Lapping, *Starlet Software*, Toronto Blue Jays & GRiD, *NiCd Notes*, Review of IMC LCD-286, 1987 Article Index.

1988

January: Portable Computer Cellular Communication, Laptop Roundtable, Pico Portable Guide, Reviews Telmagic, Direc-Tree Plus, SchwabLine, Quotrek.

February: TenniStat, Flexibility of Form, T200 and T16, Reviews Eclipse, T1100 Hard Drive.

May: Handhelds Fight Crime, A Pico in China, Compaq Port. III, Datavue Snap, Fax hits the Road, HP Portable Vectra, T1400LT, Three Pocket Modems, Close-Up's Customer & Support.

June: Multispeed in the Tropics, *Monitoring Alkaline Batteries*, PSION and Mass Storage, Datavue Spark, Smith Corona Portable Word Processor.

July: Toshiba on the Road, *Diskette Ratings, Metered NiCd Manager*, Procomm on the NEC, WordPerfect 4.2 on the T1000, Sales Ally.

September: Laptops & the Learning Disabled, WordPerfect 5.0, Dynamac EL, HP-71B, WordPerfect Executive, Webster's New World Writer II.

October: Portables at Sea, Macintosh Navigating, Piloting and Celestial Progs, NEC-8300, Compaq Port. 386, File Transfer, Golden Parachute.

November: European EMAIL, New Tricks for your Cassette Recorder, Pico Pillows, Amstrad PPC-640, Selecting the President, Sales Power, Sales Strategy, Office Writer goes Light.

December: *FASTECH*, Automating Your Sales Force, Al, ScriptWriter, LiteDrive, Homeword Plus, VP-Expert.

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passed our highest expectations for quality and clarity."

Lucid Spreadsheet: This is the one PICO magazine says "blows Multiplan right out of the socket" and Infoworld performance rated as "excellent" and said "makes the Model 100 compute." Gives you features you cannot get with Lotus 123. Lets you build spreadsheets in your Model 100 that would consume 140-150K on a desktop. Program generating capability with no programming knowledge required. Variable column widths. Includes find and sort with function key control. It's fast, recalculates like lightning. No feature has been taken from the original, only new ones added.

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you like. Complete math between fields. Total interface with Lucid worksheets.

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