

TERRY KEPNER'S

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TANDY LAPTOP COMPUTING VOLUME 5, NUMBER 6 JUNE 1988



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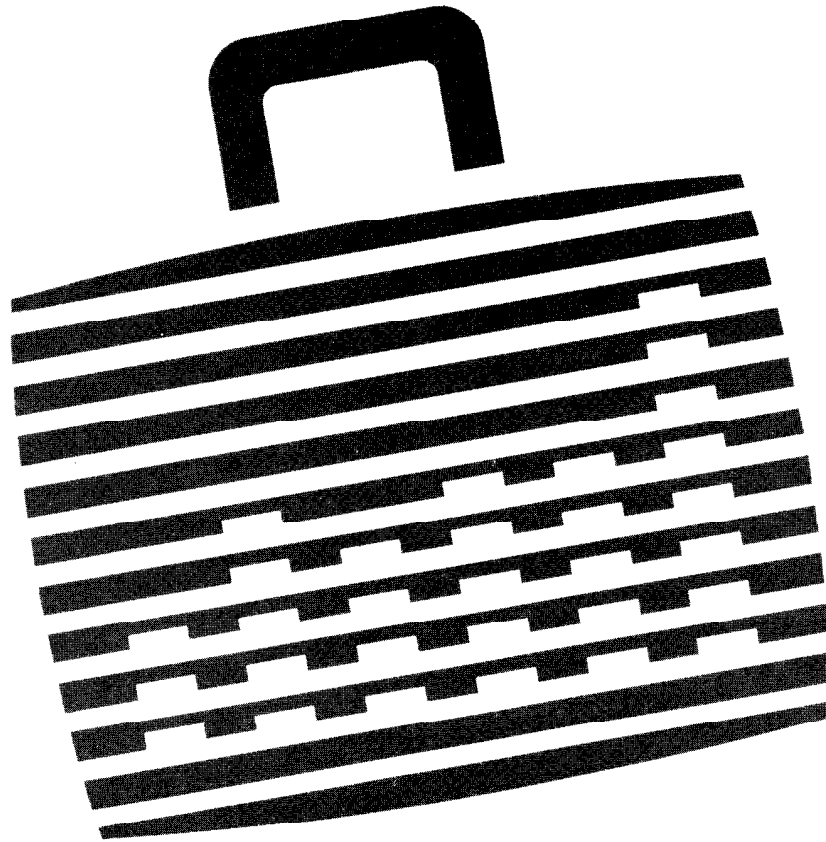
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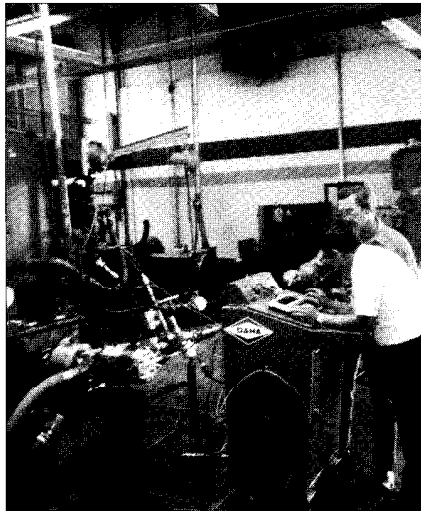
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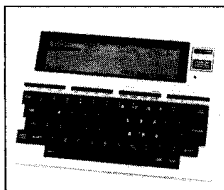
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ON
THE
COVER: The
Tandy 100
connected to
an industrial
machine in the
test lab, of the
Dana Corp.



VOL. 5, NO.6
JUNE 1988



INS AND OUTS WITH THE SIAS CIP35

by Jim McBurnett

Monitor and control heavy industrial equipment with your Tandy 100/102, 200, or 600.

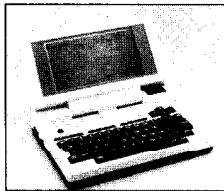
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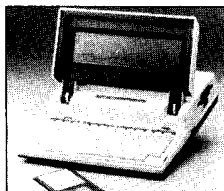


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ROM WITH A VIEW

The notebook computer is NOT TOY! You and I already know this, everyone else is about to learn it.

A notebook computer is a pint-sized box of potential power. Those of us who have taken it to heart have found a wealth of useful and powerful applications which simply can't be touched by other types of computers. Nothing else is quite as portable, as easy-to-use, as available as a notebook computer application.

The notebook computer industry has grown so large over the past few years that notebook users are beginning to finance some astounding technology advances. Companies are finding it worthwhile to invest in research and development for the notebook line, knowing that once they produce a technological enhancement, their investment will be repaid. What's more, it's a self-perpetuating cycle. One person will build on another's achievement so that the utilities and peripherals one person creates today, will be used by another to create even more tomorrow. One company introduces a disk drive, another an enhanced operating system, then an accounting package that uses the operating system... it goes on to the benefit of all of us.

The key is communication. If the inventor and the user can possibly get together, then a thing called SYNERGY happens. Synergy takes effect when "The whole is greater than the sum of it's parts." An example would be if one person develops a disk drive without a useful disk operating system, another develops an operating system, but lacks a disk drive, and another develops a spreadsheet which is only slightly useful because it has nowhere to store large spreadsheets. Individually, the parts are of little value... together they are an outstanding business tool. By communicating with each other about our needs and our inventions, we create Synergy and everyone wins.

Reading this are perhaps hundreds of potential innovators and thousands of potential users... and new ones are coming aboard daily. The idea you have been toying with may likely be the solution to a problem shared by many users; in other words a viable and profitable product. The new ideas and products which will increase the value of the notebook computer line will come from you. We encourage you to participate in this portable computer revolution by providing a means of communication. Our Bulletin Board System, Market Place section, the Classifieds, and our new ninth page ad are some of the ways we can help you communicate. If you have a product that appears to be saleable or if you need some specific type of hardware or software... let us know.

Synergistically,
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Basic For Beginners

Just got my magazine in the mail today. My, how refreshing to have someone of your caliber admit a screw-up...and then take direct action to improve the situation! I commend you for your ethics and desire to communicate directly with subscribers in such an effective way.

Now a couple of thoughts:

For us amateurs who enjoy using a Model 100/102, how about including a column on Basic programming. I read most of your articles, but find many of them written for the person who has a medium to high degree of understanding in Basic programming. I have yet to reach that point and would find a regular column... perhaps titled *Basic Basics*...a great help in understanding the whys and wherefores of this programming language.

Also a primer in machine language would also be helpful. I read the articles that say DATA:23,47...etc, but don't have the foggiest idea what that means.

Along this line, Alan Zeichick's MAXRAM column this month is interesting to me because it details some basic BASIC programming information that I have not seen detailed before. However, check the page #37, sub-paragraphs under "other errors are often harder to find." 1 through 5 repeat the same info as the preceding 1 to 5 paragraphs on page #36. Say What???

One aspect of the magazine I do like is the wide variety of articles, from the fun type games to specific useful projects. That's what makes Portable 100 interesting to read and the reason I have recently extended my subscription.

To summarize... I hope you and your staff will build a valuable magazine that can be enjoyed by a majority

of your constituents... us neophytes... and the technically competent as well.

**Dave Towne
Mt. Vernon, WA**

Because several people have written about a BASIC Column, we are in the process of setting up a series of articles on that subject.

Eds

600 PROBLEMS IN PUERTO RICO

I, Rafael Florit-Lebro, own a Tandy 600 and want to know of any hardware, software, external 3.5 inch 720K disk drive, manuals, etc. Tandy of Fort Worth, Texas gave me your address.

My laptop is expanded to 128K, has the following ROM: Word, Calendar, File, Telcom, Plan and Basic. I wonder and would like to be able to interface an external monitor or have a cassette port.

**Dr. Rafael Florit-Lebro
Rio Piedras, Puerto Rico**

You can get support for your Tandy 600 from Dennis Rogers, PO Box 218778, Houston, Texas 77218-8778

Eds

SOLVING THE GLITCH: SUPER ROM AND TS-DOS

Kevin Marsh, in your April 1988 I/O section, issues a panicky warning about an incompatibility between TS-DOS (by Traveling Software) and Super ROM (by Portable Computer Support Group). "Problems occur in the spreadsheet," he says. "Neither manufacturer has resolved problem."

It would help if Mr. Marsh were more specific about his difficulty. What problems, precisely, have occurred? What is the substance of his communication with the vendors? With this information, the readership might be able to provide solutions, or

at least some insight.

As one of the first purchasers of both Super ROM and TS-DOS, I have used them together intensively with only one glitch. I assume it is the same one experienced by Mr. Marsh. If his complaint is what I think, it has been solved by Traveling Software in its latest release of TS-DOS (available to current owners for a small upgrade fee). Long before that, however, I had developed a fix for the problem with the help of PCSG software engineer.

The problem is this: The *cut* and *copy* functions of the Lucid spreadsheet create a paste buffer similar to that of the Text program. This buffer takes the form of a machine language file that normally is invisible, but which appears on the old TS-DOS menu as 4PCS.G. The filename, as it exists in the Model 100's directory workspace, starts and ends with a null character (ASCII 0). This shifts it, and all succeeding filenames, leftward on the TS-DOS menu so that TS-DOS cannot read any of them properly.

The current release of TS-DOS solves the problem by ignoring invisible files (as it should have done all along). Otherwise, one may solve the problem by killing the paste file after using Lucid. Unfortunately, a simple *KILL* command will not work because it does not recognize the buffer filename as valid. The trick (suggested to me by PCSG) is to poke a .CO extension into the filename, where it resides in the directory, then kill it.

The short program in listing one does the job. It (1) checks the Model 100 directory to see whether the buffer file exists; (2) replaces the nulls in the filename and pokes in a .CO extension if it does; and (3) kills the file.

I hope this information is helpful. It would be too bad if any reader

were discouraged by Mr. Marsh from purchasing *TS-DOS* or *Super ROM*, as both are outstanding products from companies that have served the Model 100 community long and well.

Gary L. Matthews
Knoxville, TN

Thanks for your help.

Eds

WANT A PEERAGE TO "EDDIE THE EAGLE?"

I read Tim Palmquist's letter in the March issue with great empathy and a real feeling of hopelessness.

I acquired a PDD2 with a great deal of hope because I use the Model 100 in my business and had reached it's KAM limits and then some. I soon discovered that Tandy's own interactive solutions ROM and the PDD2's DOS could not be used at the same time.

A quick call to the Tandy customer

always anxious to read about their new (and improved) products in your magazine. Every piece of equipment and hardware I have purchased was brought to my attention by your publication!

Bob Walstead
Colorado Springs, CO

Does anyone have any advice for Bob on how to solve his problem?

Eds

CORRECTION TO THE hpCALC PROGRAM

Kent Hansen pointed out that my hpCALC program for the Model 100 didn't handle the CLX or "clear X" function properly. It clears the X register to zero, but the next number entered pushes that zero onto the stack, instead of replacing it. The fix is simple: remove JF=1 and CR=1 from line #52 so it reads: 52 LX\$= X\$(1): IFP= 7 THEN X\$(1)="0": GOSUB 76:

tion on the 600 in the magazine. However, I need imminent help now. Where can I get a spell checker program for the 600's WORD word processing? Please help if you can.

James J. McKeever
Greenwich, CT

NEW WAY TO DO A TO DO LIST

I am a relatively new user to the world of the Tandy 100/102/200. I originally purchased a Tandy 200 to write memo's during my daily train ride to work. One evening I developed a way of using the LIST function inside of TEXT to keep a to do list.

A popular way to set up a to do list is to list the items you need to do on a given day, and assign them a priority level. In the TEXT function, I created a file called TODO.DO. I then enter my list as follows: date, priority, and task.

```
10 S$=CHR$(0)+"4 PCSG"+CHR$(0):X$="":FORI=63933TO64142STEP11:IFPEEK(I)>@THEN30
20 FORJ=1TOI+7:X$=X$+CHR$(PEEK(J)):NEXT:IFX$<>S$THEN30ELSEPOKEI,ASC("A"):POKEI+6,
ASC("C"):POKEI+7,ASC("O"):KILL"A4 PCS.CO"
30 NEXT:MENU
```

Listing 1. A BASIC program to remove SuperROM from your MENU.

service number revealed that, from their perspective, "That just the way it is."

I suppose that I could get Radio Shack to eat the PDD2 or interactive solutions but I want my cake and I want to eat it too!

The logical answer is to find a DOS that will allow me to retain interactive solutions but I have yet to see a manufacturer who says that theirs will, and I do not possess the expertise to tailor anything to make it fit.

Budget prevents a multilateral "cost is no object" approach but a modest expenditure for a DOS or other method of preserving my spreadsheet and word processing seems inevitable.

I have ruled out sending a ticking package to Tandy's design department as not being solution oriented.

If a reader or advertiser has a solution to my dilemma, I will raise him/her to a peerage with "Eddie the Eagle."

Tell your advertisers that we are

RETURN

JF and CR are the variables I use to keep track of stack rolling. If they are not set equal to one, then CLX works fine. I prefer to use the DELETE function myself, since it accomplishes exactly the same thing without throwing a phantom zero on the stack to confuse you.

Scott T. Schad
Tulsa, OK

SKETCHPAD FOR THE NEC 8201

We're interested in Sketchpad for the NEC 8201, also, as expressed by Melvin Zwillenberg's letter in the January 1988 issue.

Mr. & Mrs. Leonard Domorsky
Flint, MI

HELP, NOW!

I enjoy your *Portable 100 Magazine* which we get at my office. I read R. M. Bittner's letter (March '88 p.7) on the 600. I too have the 600 and I would like to see more articles and informa-

The following is sample list.

- 3/15 A. 1. Make appt to discuss budget with Ron.
- 3/17 A. 2. State payroll tax deposit.
- 3/15 B. 3. Review bank reconciliations.

Using the F4 key to enter the LIST function, and the F1 key to enter the FIND mode, I can access my to do list in a number of ways.

LIST: Find 3/15 A. lists priority "A" items for 3/15.

LIST: Find 3/15 lists all items for 3/15.

LIST: Find A. lists all priority "A." items.

Notice that the period after the A keeps LIST from finding any item with a capital "A".

This is a simple and effective way to use a built in feature without any programing. You can enter your to do items for any day in any order, and quickly find them.

David Goodman
Salem, MA_{cont.}

I APPRECIATE THE ADVERTISERS

I just received my sixth edition of *Portable 100 Magazine* with my normal degree of delight. I had been limited to only PCM for almost a year, but now I get the two best computer magazines available. Your *Portable 100* magazine is great! You do a darn good job of *covering the field* with articles for the beginner through the more complex, technical ones for the *pro*. Besides the articles, I really appreciate the advertisers. It's the only way I have of learning what is available for my Model 100, which I love.

I am one of those lonely owners of the DVI (disk video interface) which has been very good to me. BUT, having wanted for a long time to upgrade to more powerful software than I could write, I scrimped and saved until I could buy the mighty *Super Rom*. (I saw it in your magazine) I was really excited when it finally arrived. After installing it, and writing a few *.DO* and *.BA* files, the time came for backup. As you may have heard, the DVI and the *Super Rom* clash. The screen was a circus and finally the system locked up tight. I had to *pull the plug* all the way down to turning off the memory switch on the bottom of the machine. Imagine unplugging your machine, removing the batteries, and then turning off the memory switch? Pain, agony, trauma.

A phone call to PCSG confirmed my fears, Yes, the *Super Rom* does not support the DVI. There is a high memory conflict and there is nothing to be done about it. I felt I had been let down, almost cheated.

But, all is not as bad as I had thought. A little persistence and experimenting and sure enough there is at least a partial solution. Turn off the *Super Rom*. It's that simple. On page S2-7 of the installation section of the manual, it explains how to do it. Go into *BASIC*, type "call 63012,0,1" and it's off, then save your *.DO* from *TEXT* and the *.BA* from *BASIC*. I haven't figured out how to save the spread sheets on the DVI yet, they just have to go on cassette. Maybe some other DVI user can figure that one out. In spite of this little problem, I love my Model 100 with the *Super Rom*. For word proc-

essing, I much prefer it over my desktop for its versatility and ease of use. It's not user friendly, it's user lovely.

One more thing, several issues back one of your readers say seeking a longer ribbon cable for his laptop to DVI hookup. Radio Shack does have an 18 inch version; unfortunately, I don't have the part number, I only have the cable. Thanks again for the super magazine.

Jerry Stotler
Cerritos, CA

*Thanks for sending in your solution.
We appreciate the assistance.*

Eds

DISAPPOINTED WITH THE QUALITY OF PORTABLE 100

I appreciated your reassuring letter attached to the cover of the February issue of *Terry Kepner's Portable 100 Magazine*. I wanted to share a few thoughts with you.

*The screen
was a circus,
and I had to
pull the plug.*

My feelings about *Portable 100* are somewhat ambivalent at the moment. On the one hand, I very much want the publication to survive, at least, so that this source of information about the Model 100 will not *dry up*. On the other hand, I have been disappointed with the quality of the articles in the magazine lately. From reading the letters, it sounds like the staff realizes the deficiency, and is attempting to correct it.

In the Letters column of the February 1988 issue, I hope you do not *overreact* to the letter from Louise Legeza. I think a magazine such as *Portable 100* needs to strike a delicate balance regarding technical depth. If every article is completely understandable to everybody, then the articles will never be able to get beyond the basics. Those who have mastered the basics will be bored and depart. Do not misunderstand; no issue should fail to include some articles

for those who are new to the machine, and indeed to computers in general, but there should also be articles for more advanced readers.

When people ask where to go for help, please also mention the services such as CompuServe and GENie. Every Model 100 comes with a built-in modem. A cable to connect to the phone line is inexpensive, and I hope it still includes a CompuServe starter kit. The modem in my Model 100 was my introduction to the national community of users, and I hope you will help others join this community.

Bill Boyd
Newark, DE

YOUR ARTICLES ARE JUST WHAT I WANT

I'd just like to say your columns, *MAXRAM* and *CUSTOM 200*, plus the articles Power Pipe and Poke program are just what I want out of *Portable 100*. Keep on doing what you are doing! In addition, I thought, I might give you some ideas for the type of things I would like to see as articles in *Portable 100*, in the future.

1. I have the LL-100 EPROM programmer, designed to work with the Model 100. I got it for three reasons: to modify the operating system, to put my database on PROMs, and to store programs (backup system). Articles that would help in this matter, I would greatly appreciate.
2. Maybe this should have been number one, but I am just starting to fully learn assembly programming. Anything *Portable 100* can offer along this line, I would appreciate, too. I could also use all the information I can get on the Model 100/200's ROM.
3. And finally, I have both Tandy Disk Drives; I have come to realize that there are other ways to write protect a diskette (other than the window on the case). Tell me how this is done and how to defeat it. Also, speak on the other secrets of these drives. Like how to write to a sector or read that sector, how the drives work, is it possible to put invisible files on disk, etc..

Oh, one last thing, in studying the ROM map for the Model 200, it ap-

pears to me that I could write a BASIC or assembly program that would utilize ROM routines to search and replace. That would be a better alternative to the search and replace BASIC program published a couple of months ago. Am I seeing things or wishfully thinking or what?

**Bernard Upshaw
Andover, MD**

Yep, you could probably do that if you were good at machine-language programming. In the meantime, we'll see if we can locate anything like that for you.

Eds

MORE MISSES IN THE MISSING LINK

As you can see by the enclosed items, I have keyed in and printed the aforementioned utility. Everything runs super including allowing itself to be buried in a multifunctional file of several thousand bytes (line #601).

There is one problem with the utility. Either I have made a mistake in the program (very likely) or the formula that is offered is improperly presented. Notice that the answer which was copied from the screen is different from that shown on page 19.

There is one character, the flat squiggle to the left of the ending E, that I was unable to find on the keyboard. A trip to the library was also of no help. I have tried several other alternates but none produce the answer as shown.

Having no background in higher math is of some hindrance to me, (as in not understanding the symbol); however, I have talked with people who should know, also to no avail. I know that it isn't life-threatening but I would appreciate any help you can give. Correct answers are reassuring.

Like Louise Legeza on page 9, I would like to see more 1+1=2 explanations and less high tech gobbledygook. The Model 100 has been my only adventure into the world of computers but I have found, by talking with other users, that it will do almost anything that the more sophisticated machines can handle only on a smaller scale. I have had no schooling in computers so I have had to look to *Portable 100* and other mags as my class room. When you consider all of the mistakes and omissions in

the Tandy manuals combined with the unexplained high tech language it is a wonder that I have learned anything at all. Thanks for the help.

**Roger Wright
Riverdale, MD**

The May issue of Portable 100 locates the missing link in Missing Link.

Eds

INTERFACING WITH THE COMMODORE

I have a Commodore computer that I download files to. I have not seen any mention of interfacing the Tandy with them yet. I'm told that there are more Commodores in the home than any other brand yet they are all but ignored. I typed in a program from *Run Mag* that interfaces my 102 with my Commodore through the modems. It was in the February 1987 issue. I'd like to see you publish a word processor. Many computer specific magazines have done that for the users. You could get it put on a ROM chip and sell it.

I would like to make a comment to the software developers. It's TOO EXPENSIVE. I can buy a word processor for my Commodore for less than \$30 bucks, including many of the programs on ROM. If someone had a Word Processor on RAM for 25 dollars I don't think they could keep up with the demand.

**Gene Masse
New Rockford, ND**

We sent a letter to the author of the article in RUN to see if he is interested in writing an article for us to allow file transfers between the Commodore and the Tandy 100/102 computers so that you could use the Commodore computer's disk drives for file storage, or to let you edit Commodore created text files. We'll let you know if anything develops.

Eds

MORE 200

Enclosed is my subscription coupon for one year of *Portable 100*. Again. I sent one in last October, before the "changing of the guard" and nothing came of it, so I decided to lay low and see what happened. Now, with the new regime in command, and prompted by your reply to a letter in the January issue, I have decided to have another go at it.

The letter was from Jimmie D. Baker and he pleaded for more consideration for the Tandy 200. I'm with him. I bought my Tandy 200 last September. My previous experience with computers was limited to a couple of adult educational classes at the local community college, using apple IIc's. I chose the 200 thinking it was an improvement over the 100/102 with its larger screen, more memory, one more program in ROM, and fold-down screen protecting the keyboard. The reasoning seems logical, but I have this growing, uneasy feeling that what I picked is a step-child, an also-ran that never got out of the starting gate. The Model 100 is still king.

I'm sure there are many more Model 100's in use than 200's, which is some justification for playing to the mode. But still, the 200 shouldn't be ignored. It's my guess that many of the programs presented for the 100 would work just as well on the 200, but this is not pointed out. With such similarity between the machines, I think the compatibility between them should be identified in all articles—even if there is no compatibility. It might save the Tandy 200 owners a lot of time and frustration.

**Gaylord E. Smith
Punta Gorda, FL**

We are definitely planning more articles for the Tandy 200 and Tandy 600 computers. As you know, from the last three issues, we have a regular column on the 200. We should have such a column for the 600 in the next few months.

As for matching the 200 to compatible 100 articles, the problem is that the programs we receive are from readers, most of whom do not have both a 100 and a 200. Further, we have neither the staff nor the time to type in all the programs, make the required changes, and then test them to see if they are compatible with the 200.

However, we do have an author in Oregon who is working on an article that will tell you how to make almost any Tandy 100 BASIC program work on the Tandy 200, including what ROM calls need to be changed for the most common Tandy 100 ROM calls (i.e., calls to the keyboard scan, graphic calls, and so forth).

Eds

□

Ins And Outs With The SIAS CIP 35

Monitor and control heavy industrial equipment with your Tandy.

By Jim McBurnett

Our division manufactures hydraulic pumps and motors for use in the mobile construction equipment industry. A necessary part of the operation involves extensive laboratory tests of the various products. We had used the Model 100/102s in the office for years and were convinced that the little computers would also do a good job in the test lab—if we could find a cost effective means for measurement and control. The SIAS Engineering (Salina, Ks 913/823-9209) CIP 35 control boards were exactly what we needed.

Figure one illustrates the general capabilities of the board. Communication is via RS-232 at a user-selected baud rate. The board will measure up to eight DC volt-

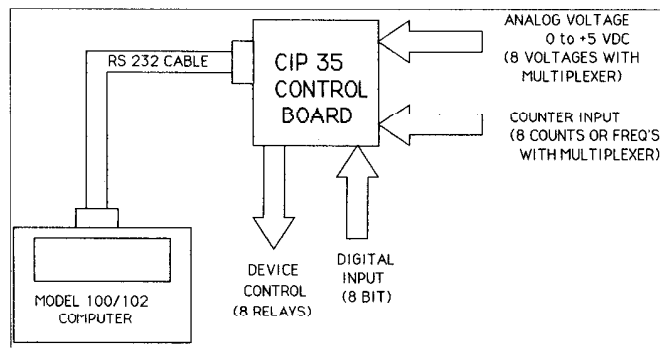
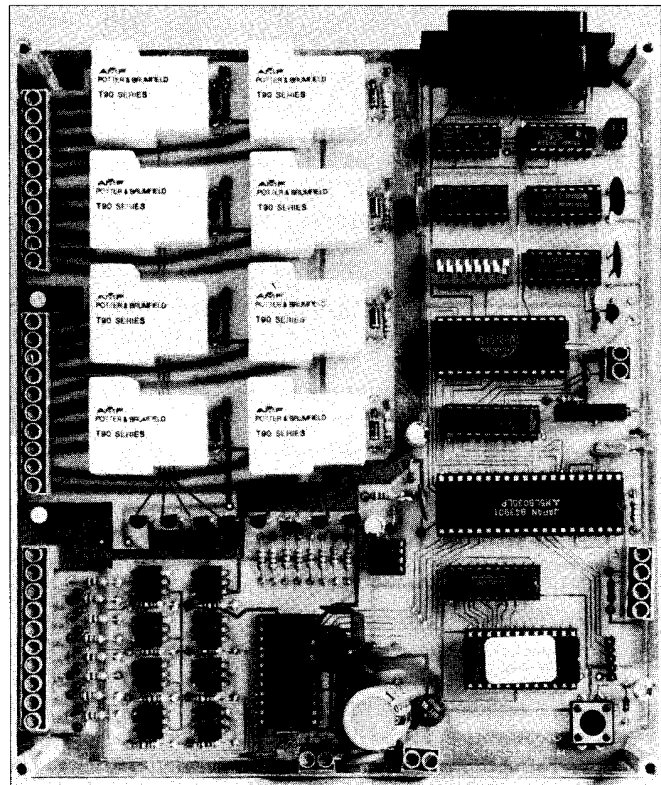


Figure 1. Control Board Overview

ages, indicate eight counts (or frequencies), determine the status of eight DC voltages, indicate eight counts (or frequencies), determine the status of eight digital input lines and control eight devices with the electromechanical relays. There is a 2K EPROM that SIAS Engineering can custom program for virtually any required task. This is an impressive range of capabilities for a board with a base price of only two hundred dollars. Sound too good to be true? It gets even better.

Before discussing methods of measurement and con-



The SIAS Engineering CIP 35 control boards can control up to eight devices.

trol, a brief description of the RS-232 communications is in order. A ribbon cable with a male DB-25 connector at each end is used to connect the CIP 35 board to the Model 100/102. The ports are compatible pin-for-pin. That is, the connection is pin 1-to-pin 1, 2-to-pin 2, etc. The baud rate is switch selectable from 75 to 9,600. We have found that the system will run error free at 9,600 baud. Communication is established by simply opening the .COM: port of the Model 100/102 for both input and output:

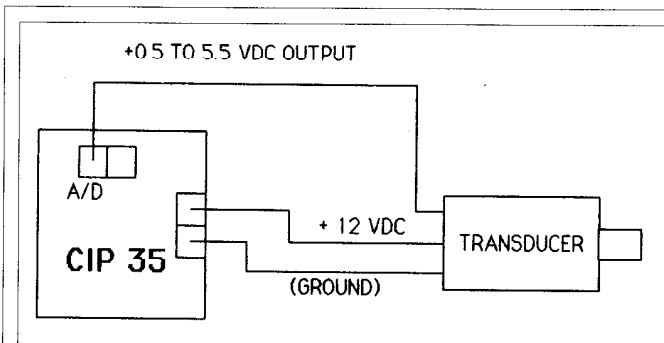


Chart 2. An example of the pressure transducer wiring.

```
10 OPEN "COM:88N1D" FOR INPUT AS 1
20 OPEN "COM:88N1D" FOR OUTPUT AS 2
```

Programming examples for obtaining physical measurements and for control functions will be given with each of the discussion below.

MEASUREMENTS IN THE LAB

In our test lab, we typically measure pressure, temperature, speed and flow rate. Also, we monitor the status of each of several switches. Finally, the on/off control of several circuits is required.

Pressure measurements are obtained with pressure transducers which generate a DC voltage proportional to the pressure level. Temperature transducers are used that generate a voltage proportional to temperature. The counting capability of the CIP 35 board is used to determine speeds and flow rates. The digital input capability is used to determine out-of-tolerance conditions of fluid level, surface temperatures, etc.. Finally, the on-board relays are used to cycle solenoid controlled relief valves.

There are a number of pressure transducers that may be used with the CIP 35, but we selected only those that require an excitation voltage of no more than 12 VDC and that have a high output voltage that can be read by the control board without additional signal conditioning. The Barksdale Series 303 (Transamerica Delaval, Barksdale Controls Div., 213/589-6181) is typical of a transducer that satisfies these conditions. The cost of this transducer is less than three hundred dollars.

The Barksdale requires an excitation voltage of 12 to 32 VDC. It has an output of 0.5 VDC at zero pressure and 5.5 VDC at rated pressure. We typically test at pressures in the 3000 to 4000 Pounds per square inch (PSI) range and usually use a transducer that has a pressure rating of 5000 PSI. This higher rating decreases the resolution somewhat but gives a bit of margin for mechanical durability (see Chart 2).

```
95 REM SEND COMMAND FOR VOLTAGE MEASUREMENT (NOTE SEMI-COLON)
100 PRINT#2,"RA1";
105 REM GET THREE CHARACTER STRING, P$
110 P$=INPUT$(3,1)
115 REM CONVERT TO PSI
120 P=(VAL(P$)-25.5)*(5000/255)
```

Listing 1. A typical programming example for reading voltage and converting to pressure.

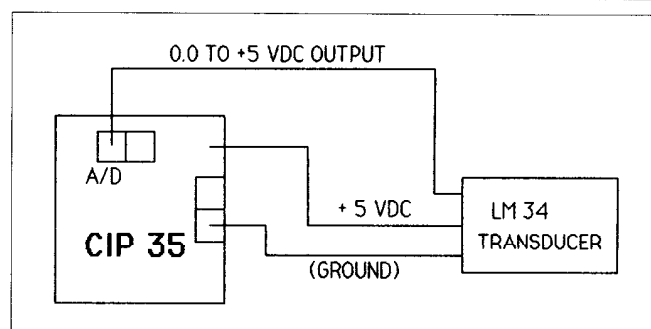


Chart 3. An example of the temperature transducer wiring example.

The CIP 35 responds to the command RA1 with a three-character string that ranges from 000 at zero volts to 255 at five volts. The transducer has a 0.5 volt output at zero pressure. This is referred to as "zero offset" and is easily handled in the program. In this example the transducer has a linear output characteristic and will have a 5.5 volt output at 5000 PSI. A typical programming example for reading voltage and converting to pressure is shown in listing 1.

The A/D converter on the CIP 35 has a resolution of eight bits, which corresponds to approximately 20 PSI for our 5000 PSI transducer example.

TEMPERATURE MEASUREMENT

The requirements for a temperature transducer are similar to those of the pressure transducer: excitation of no more than 12 VDC and a high (0 to +5 VDC) output voltage. We have found that the National Semiconductor LM34 Fahrenheit Temperature Sensor fulfills these requirements nicely. Also. The cost of this sensor is less than four dollars.

We use an excitation voltage of 5 VDC for the LM34. This voltage is available from the CIP 35. Current draw is less than 70 micro-amps. The rated temperature range is -50 degF to +300 degF, with a non-linearity of only 0.5 degF.

The eight bit resolution of the CIP 35 A/D converter results in a temperature resolution of 2 degF. We feel that this is adequate for our laboratory tests of hydraulic components. An example is shown in Chart 3.

Programming for temperature measurement is virtually identical to that for pressure as shown in listing 2.

The two previous examples illustrate the simplicity of obtaining either pressure or temperature measurements. In order to measure both, a multiplexer is required. This is available from SIAS Engineering and increases the number of voltage measurements to eight (single-ended). The cost of the multiplexer is about twenty-five dollars. (The latest boards will have an integral 8 channel multiplexer.)

```
195 REM SEND COMMAND FOR VOLTAGE MEASUREMENT (NOTE SEMI-COLON)
200 PRINT#2,"RA1";
205 REM GET THREE CHARACTER STRING, T$
210 T$=INPUT$(3,1)
215 REM CONVERT TO DEGREES FAHRENHEIT
220 T=2*VAL(T$)
```

Listing 2. The programming for temperature measurement is virtually identical to that for pressure.

APPLICATION

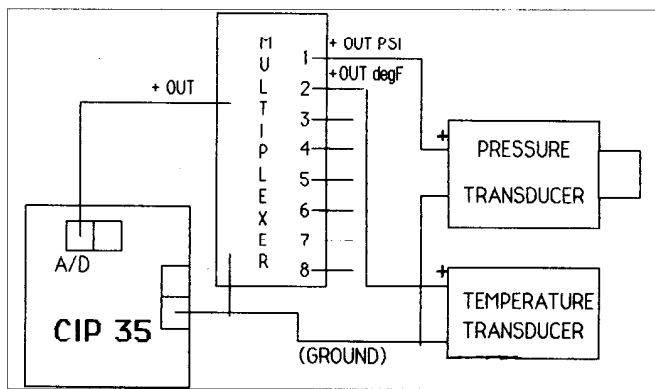


Chart 4. An example of multiplexer wiring with the excitation circuit not shown.

```

100 PRINT#2,"RA1";REM SELECT CHANNEL #1 (PRESSURE)
110 P$=INPUT$(3,1);REM GET THREE CHARACTER STRING
120 P=(VAL(P$)-25.5)*(5000/255);REM CONVERT TO PRESSURE, PSI
200 PRINT#2,"RA2";REM SELECT CHANNEL #2 (TEMPERATURE)
210 T$=INPUT$(3,1);REM GET THREE CHARACTER STRING
220 T=2*VAL(T$);REM CONVERT TO DEGREES FAHRENHEIT
    
```

Listing 3. Measurement of pressure and temperature.

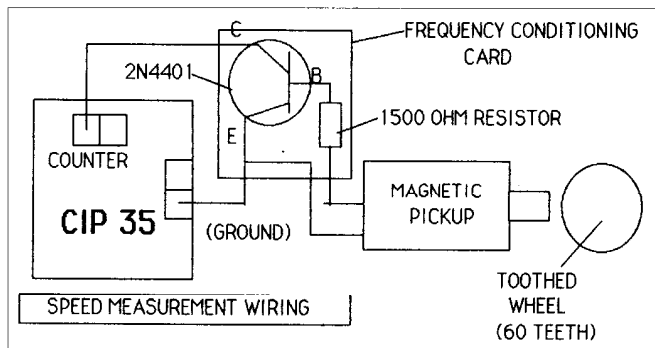


Chart 5. The speed measurement wiring measure shigh and low voltage.

```

300 PRINT#2,"T10";REM COUNT FOR ONE SECOND
310 S$=INPUT$(3,1);REM GET COUNT RESULT (3-CHARACTER STRING)
320 S=K*VAL(S$);REM CONVERT TO SPEED, RPM (NOTE:K=1)
    
```

Listing 4. The program segment that measures speed in RPM.

MULTIPLEXING VOLTAGES

The addition of a multiplexer expands the capability of the CIP 35 to measure eight single-ended voltages. This example is based on the pressure and temperature transducers previously discussed. Chart 4 shows an example of multiplexer wiring.

The program command RA1 results in the measurement of pressure and the command RA2 will result in the measurement of temperature (see listing three).

This configuration can be expanded to a maximum of eight transducers of various types. Note that all transducers must have a common ground. This restriction may be overcome by adding a second multiplexer, which is used to switch the low side of the transducers. This effectively provides a double-ended switching capability. The wiring diagram for this is similar to that given above and is not illustrated here.

The counting capability of the CIP 35 is used to measure frequency.

FREQUENCY MEASUREMENT

Laboratory tests of hydraulic components typically require the measurement of speed and flow rate. These measurements are accomplished with the counting capability of the SIAS CIP 35 board.

The counter responds to the opening and closing of a switch. The maximum rate of these counts is approximately 100,000 counts per second. The result of the count is returned as a three character string having a range of 000

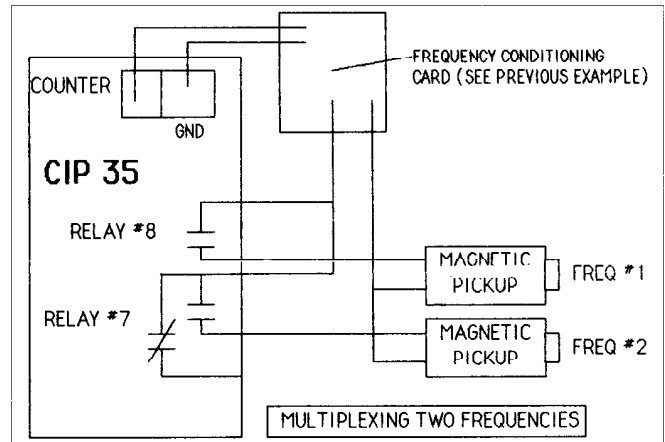


Chart 6. Four relays in use for frequency pickups.

to 999. The count duration is program selectable from 0.1 second (T01) to 9.9 seconds (T99). This results in a usable frequency range of 0.101 Hertz to 9990 Hertz. The conversion from frequency, in Hertz, to speed, in revolutions per minute, or flow rate, in gallons per minute, is accomplished in the Model 100/102 BASIC program.

The example given below illustrates one method of measuring speed. Flow rate measurements are obtained similarly.

A common method of generating a frequency proportional to speed is through the use of a magnetic pickup and toothed wheel. There are any number of magnetic pickups on the market and any will suffice so long as it generates a sinusoidal voltage which has an amplitude of at least three volts peak-to-peak. A frequency conditioning card fulfills the switch requirement for the CIP 35 counter. When the transistor base voltage is high, the switch is closed. When it is low, the switch is open. Chart five shows the speed measurement wiring diagram.

The use of a wheel with 60 teeth results in a frequency, in Hertz, that is numerically equal to shaft speed in revolutions per minute. Listing four measures speed, in RPM.

Counting intervals other than one second would require a conversion factor other than K=1 in line 320. For example, counting for one-half second (T05) would require that K have a value of two, etc.

MULTIPLEXING FREQUENCIES

There are two techniques for multiplexing frequencies

with the SIAS CIP 35 control board. One requires the use of an external multiplexer card and is virtually identical to the technique previously described for multiplexing voltages. The other technique makes use of the electromechanical relays on the board itself. This technique will be described here.

The relay contacts have a ten amp rating but the CIP 35 board traces are rated at four. This is more than enough for the output of most frequency pickups. There are eight relays on the CIP 356 board. The example in chart six illustrates the use of four. Relays one, three and five are schematically the same as relay seven. Relays two, four

```

400 REM MEASURE FREQUENCY #1
410 PRINT #2, "7F80":REM RELAY 7 OFF, RELAY 8 ON
420 FOR I=1 TO 25:NEXT I:REM WAIT FOR CONTACTS TO STOP BOUNCING
430 PRINT #2, "T05":REM COUNT FOR 0.5 SECONDS
440 F1$=INPUT$(3,1):REM GET THREE CHARACTER STRING
450 F1=K1*VAL(F1$):REM CONVERT TO FREQUENCY OR SPEED, ETC
500 REM MEASURE FREQUENCY #2
510 PRINT #2, "708F":REM RELAY 7 ON, RELAY 8 OFF
520 FOR I=1 TO 25:NEXT I:REM WAIT FOR CONTACTS TO STOP BOUNCING
530 PRINT #2, "T03":REM COUNT FOR 0.3 SECONDS
540 F2$=INPUT$(3,1):REM GET THREE CHARACTER STRING
550 F2=K2*VAL(F2$):REM CONVERT TO FREQUENCY OR SPEED, ETC
    
```

Listing 5. The commands for controlling any of the relays.

```

600 PRINT #2, "10":REM TURN ON THE ELECTRIC MOTOR
610 REM WHILE THE MOTOR IS COMING UP TO SPEED,
620 REM VARIOUS SYSTEM CHECKS (SPEED, TEMPERATURE, ETC) ARE MADE.
630 REM IF ANYTHING IS OUT OF SPEC, THE COMMAND "1F" WOULD BE SENT
640 REM TO TURN OFF THE MOTOR.
650 REM PRESSURE CYCLING LOOP STARTS HERE
660 PRINT #2, "20":REM INCREASE PRESSURE TO PRE SET VALUE
670 FOR I=1 TO 300:NEXT I:REM WAIT ABOUT ONE SECOND
680 PRINT #2, "2F":REM REDUCE PRESSURE TO MINIMUM
690 FOR I=1 TO 300:NEXT I:REM WAIT ABOUT ONE SECOND
700 GOTO 650:REM DO IT AGAIN
    
```

Listing 6. The cycle rate is determined by "FOR NEXT" loops.

and six are the same as relay eight.

The command for controlling any of the relays has the form: *NS*, where *N* is the relay number and *S* is the state (*O* turns it *On*. *F* turns it *oFf*). Listing five illustrates these commands.

The relays may also be used for controlling virtually any ON/OFF device. Two of our typical uses include control of an electric motor and cycling a solenoid-controlled relief valve. Brief descriptions of these applications follow.

RELAY APPLICATIONS EXAMPLE

The eight electro-mechanical relays on the CIP 35 control board may be turned on or off in any desired combination. For example, the command *10203040* would turn on relays one through four. The command *1F3F* would turn off relays one and three. Chart seven illustrates the use of relay one to control an electric motor, which drives a hydraulic pump, and relay two, which cycles a solenoid controlled relief valve, causing a change in the pressure in a hydraulic circuit.

When relay two is off, the hydraulic pressure will be minimum. When it is turned on, the hydraulic pressure will increase to a previously set value. The cycle rate is determined by *FOR-NEXT* loops in the program as shown in

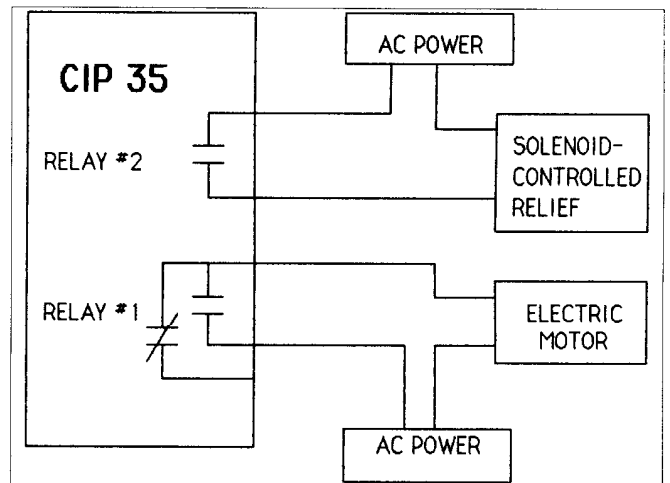


Chart 7. The use of relay 1 and relay 2

listing six.

Rather than simply waiting (lines 670 and 690), we use this time to check pressures, temperatures, and flow rates. The test stand itself is also checked through the use of ap-

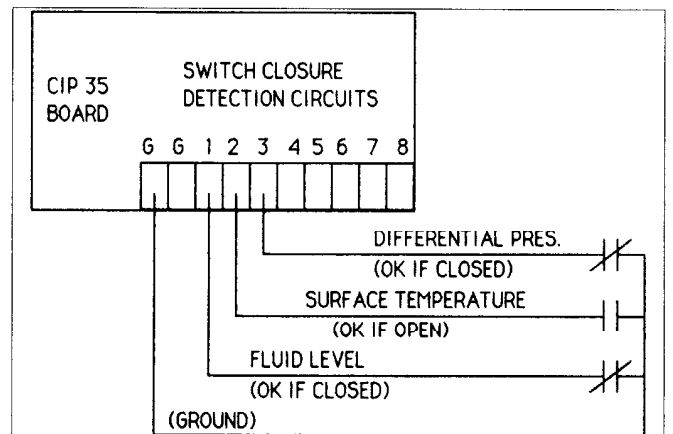


Chart 8. Switch applications.

propriate switches and the CIP 35 digital input capabilities, discussed next.

USE OF DIGITAL INPUTS FOR SYSTEM CHECKS

The CIP 35 board will handle up to eight digital inputs. This capability could be used to read two 4-bit devices or one 8-bit device, for example. Our use of the board for hydraulic testing and data acquisition is somewhat different. We use the digital input ports to detect switch closures. Various switches are placed through out the test stand to verify that the condition of the stand itself is satisfactory.

For example, a float switch is placed in the hydraulic reservoir. If the fluid level is adequate, the switch will be closed. Surface temperature switches are also used to monitor various components on the test stand. If the surface temperature is below some pre-selected maximum,

APPLICATION

the switch will be open. A differential pressure switch is used to verify that the hydraulic filter is in satisfactory condition. These applications are illustrated in Chart eight.

To check the condition of a switch, the command "NI" is used, where N is the number of the switch and I indicates a digital input. In the CIP 35 scheme of things, a "1" is returned if the switch is open and a "0" is returned if it is closed. A programming segment for Chart eight is listed in listing seven.

POWER CONSIDERATIONS

There are a couple of ways to supply power to the CIP 35 control board. A 12 VDC power supply can be connected to the "12 VDC" terminals or a 12 VAC power supply can be connected to the "12 VAC" terminals on the board. We use the latter, which is illustrated below.

The CIP 35 board includes the necessary hardware to rectify and filter the 12 VAC supply. This provides a 12 VDC source which we can use as excitation voltage for various transducers, discussed previously. The addition of the external battery improves the system in several ways. The system Power Wiring Diagram is pictured in Chart 9.

When the 12 VDC source is used as excitation voltage for a transducer, there is often an undesirable 60 Hertz ripple in the transducer output. The addition of the battery tends to eliminate this source of 60 cycle noise by providing a rock solid excitation voltage.

The battery also protects the system from voltage spike or power droops that are often encountered in a laboratory where electric motors of up to 600 horsepower are being turned on and off.

The 7805 voltage regulator (Radio Shack part number 276-1770) enables the 12 VDC system to power the Model 100/102. This not only protects the computer from voltage glitches, but allows the entire system to become portable. We use a sealed lead-acid battery with a 6.5 amp-hour rating. A good example is the *Technacell* by Elpower (model EP 1265, about \$40). This will power the system, including transducers, for twelve to fourteen hours in the field.

ADDITIONAL COMMENTS

The Model 100/102 in combination with the SIAS CIP 35 control board represents an extremely cost-effective solution to data acquisition and control. For less than a thousand dollars, we have a computer-based system that can perform virtually any required task in the test laboratory. Also, with careful selection of transducers, the entire system becomes portable and can be taken to the field in a suitcase.

Incredibly (to me at least), the CIP 35 has additional capabilities. It has a 2K EPROM that SIAS Engineering can custom program for a seemingly endless variety of requirements. This can include a complete program for running repetitive tests without the need of the computer. The CIP 35 can even be run remotely through the use of a modem!

We have equipped all of our endurance test stands with

systems described earlier. The systems have proven to be very reliable in spite of the abuse that seems inevitable in a test lab. The dusty, oily, sometimes very hot or very cold environment has had no detrimental effect on either the Model 100/102's or the CIP 35 control boards. These systems are used around the clock to control tests, monitor test stand conditions and to take and store test data. The data are stored in the Model 100/102 in document files for later analysis, printing, report writing, etc.

The Model 100/102 has taken occasional lumps for its lack of memory. We have not found this to be a serious problem. When RAM begins to get tight the data files are simply transmitted, using the internal modem to our CAD/CAM system. This system currently has a 300

```
1000 REM SUBROUTINE TO CHECK CONDITION OF SWITCHES
1010 PRINT*2,"112131";:REM GET STATUS OF SWITCHES 1,2 AND 3
1020 S$=INPUT$(3,1):REM GET 3-CHARACTER STRING
1030 IF S$="010" THEN RETURN:REM ALL "OK"
1040 REM CHECK FOR OUT-OF-SPEC SWITCH AND TAKE NECESSARY ACTION
ETC.
```

Listing 7. An example of the switch condition.

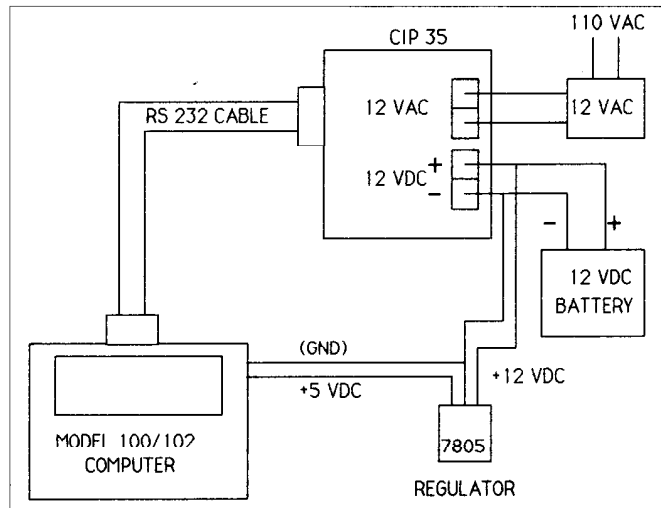


Chart 9. The system power wiring diagram.

megabyte hard disk drive, which should suffice for a good long while.

The accumulation of large quantities of data often requires analysis. We have developed a BASIC program which does limited statistical analysis on data. The program will: plot results to the LCD; find the maximum, minimum and standard deviation; determine histogram information; conduct linear regression analyses, and calculate rolling averages—but that's another story. □

Jim McBurnett is the Product Development Manager, Mobile Fluid Products Division, of the Dana Corporation.

Men-u-tility

*A program to change files
without leaving the main menu.*

by Greg Susong

Does this sound familiar? You enter *BASIC* on your Model 100, type *FILES*, enter the fifteen keystrokes necessary to delete a file and press *ENTER*.... then you type *FILES* again to refresh the display, type fifteen more keystrokes to delete another file, etc. What a bother! Have you ever counted the keystrokes it takes to rename a file? Twenty-nine if you count pressing *ENTER*. It's crazy!

Now there's a better way. With *Men-u-tility* you can kill a file with as little as three keystrokes. You can also rename files, print files, make files invisible or visible, set the day, date and time, set an alarm, and check the memory requirement of any file, all without ever leaving the main menu. Does this sound like ad copy? Well, it's close. Through my now defunct company, Custom Software, my wife Carol and I sold hundreds and hundreds of these programs for \$24.95 each. Now we've decided to give it away.

Most machine language programs you will encounter must reside at a certain location in memory. This often causes conflicts when you try to use more than one at a time. *Men-u-tility* is designed to be placed anywhere in memory, thus allowing you to avoid this type of conflict.

Men-u-tility comes in two parts, *MLOAD.BA* (see listing 1) and *MCODE.DO* (see listing 2). The *MLOAD.BA* program is the loader. It asks you where to locate *Men-u-tility* and then reads the *TEXT* file, *MCODE.DO*, and adjusts it to fit into that location. Type in the *BASIC* program (listing 1) and save it. Type in the *TEXT* file (listing 2) and save it with the name *MCODE.DO*. If you don't want to type in both listings I will mail you a copy of the programs on tape. Please send \$5 to cover my costs to:

Greg Susong
1308 Western Ave.
Wellington, KS 67152

GETTING STARTED

Before you can load *Men-u-tility* you must decide where you want to place it in memory. The ideal place to

```

5 CLEAR 256:IF MAXFILES<2 THEN MAXFILES=
2
6 Q$="YyNn":CLS:PRINT"Loader/Relocator":
PRINT"(C) 1984 Custom Software":PRINT"All
rights reserved":PRINT:INPUT"Locate Me
n-u-tility at address";SA:GOSUB 42:IF SA
+1954>MAXRAM THEN BEEP:PRINT "Program wo
uld exceed high memory limits.":END
13 OPEN "MCODE.DO" FOR INPUT AS 1:X=SA
15 LINEINPUT#1,B$:L=L+1:FOR V=1 TO LEN(B
$):CS=CS+ASC(MID$(B$,V,1)):NEXT:READ CC:
IF CS<>CC THEN PRINT"Line";L;"in the MCO
DE.DO file is incorrect":PRINT"Please re
type":CLOSE:END: ELSE CS=0
16 R=1:A$=""
17 IF MID$(B$,R,1)="*" THEN A$=MID$(B$,R
+1,INSTR(R+1,B$,"*")-R-1):R=R+LEN(A$)+2:
GOSUB 33: ELSE A$=MID$(B$,R,2):R=R+2:GOS
UB 37
18 PRINT@240,"Loading at";X:
19 IF R < LEN(B$) THEN GOTO 17
20 IF NOT EOF(1) THEN 15
21 CLOSE:CLS:PRINT"Program loaded from";
SA"to";SA+1953:SAVEM "MENUTL.CO",SA,SA+1
953,SA:END
33 VA=SA+VAL(A$):POKE X+1,INT(VA/256): P
OKE X,VA-(INT(VA/256)*256):X=X+2:RETURN
37 CV$=A$:GOSUB 39:POKE X,CV:X=X+1:RETUR
N
39 CV=0:T=LEN(CV$):FOR I=1 TO T:K=ASC(MI
D$(CV$,I,1))-48:IF K>9 THEN K=K-7
40 K=K+32*(K>41):IF K>15 THEN RETURN ELS
E CV=CV*16+K
41 NEXT I:RETURN

```

continued

Listing 1. The BASIC program loader for *Men-u-tility*.

PROGRAMMING

put it is just below *MAXRAM*. If you aren't using any other machine language programs, or your other machine language programs are relocatable, then I suggest that you place it there. *Men-u-tility* is 1,954 bytes long. To find the start address for the program, go into BASIC and type: *PRINT MAXRAM-1954* and press *ENTER*.

If you have other machine language programs in RAM that cannot be relocated you must locate *Men-u-tility* below their start address. Using the documentation from the other program, determine the start address of that program and subtract 1,954. This will be the start address to give the loader program.

Go to BASIC and type: *CLEAR 256,xxxx* replacing the *xxxx* above with the start address that you decided on. Now type: *RUN "MLOAD.BA"* and press *ENTER*. You will be prompted to type the start address for the program. Type the start address you've decided upon and press *ENTER*. The loader will begin reading the *MCODE.DO* file and creating your custom copy of *Men-u-tility*. The loader will warn you if an error occurs. The three possible errors are:

Program would exceed high memory limits. The start address you gave the program is too high. Recalculate the start address and try again.

Memory not clear for this address. Memory has not been protected for the area you have told it to locate *Men-u-tility*. Follow the instructions that appear after the error message and try again.

Checksum error—Try again. You have made an error typing in the *MCODE.DO* file. I suggest that you and a friend proof read the file to find the error.

Now is the best time to create a backup copy of the actual machine language program. If you should have to remove *Men-u-tility* it is much faster to reload it from a backup copy than to use the loader again. From the BASIC OK prompt, type: *LOADM "MENU TL"* and press *ENTER*. The screen will show:

```
Top: aaaaa
End: bbbbb
Exe: aaaaa
```

Put a blank cassette into your recorder and press *PLAY* and *RECORD*. Then type: *CSAVEM "MENU TL.CO"*, *aaaaa, bbbbb, aaaaa* replacing *aaaaa* and *bbbbbb* with the actual values shown next to "Top:", "End:" and "Exe:". You should also make backup copies of *MLOAD.BA* and *MCODE.DO* if you haven't already done so.

INSTALLING THE PROGRAM

To install *Men-u-tility*, position the cursor over the file named *MENU TL.CO* and press *ENTER*. The Model 100's main menu will be replaced with *Men-u-tility*. You may now kill the files named *MENU TL.CO*, *MLOAD.BA* and *MCODE.DO*.

The date, day and time are still in their normal position. Just to the right of the time, a figure representing the number of free bytes available is displayed. This was previously shown on the bottom line of the menu.

To the right of the free bytes is the file length indicator.

```
42 IF SA<HIMEM THEN BEEP:PRINT"Memory not clear for this address.":PRINT"Type CLEAR 256,";SA;":RUN":END
43 RETURN
100 DATA 3100 ,3209 ,3591 ,3478 ,3366 ,3511 ,3209 ,3315 ,3045
110 DATA 3190 ,3142 ,3450 ,3285 ,3515 ,3241 ,3398 ,3283 ,3465
120 DATA 3381 ,3278 ,3225 ,3308 ,3326 ,3258 ,3297 ,3048 ,3464
130 DATA 3358 ,3213 ,3173 ,3027 ,3147 ,3155 ,3197 ,3350 ,3232
140 DATA 2943 ,2805 ,2856 ,3105 ,3023 ,3010 ,2952 ,2997 ,3020
150 DATA 3176 ,3179 ,3283 ,3092 ,3207 ,996 ,3267 ,3269 ,2983
160 DATA 3264 ,3413 ,3209 ,3194 ,3214 ,3284 ,3129 ,3243 ,3134
170 DATA 3211 ,3203 ,3287 ,3078 ,3136 ,3165 ,3067 ,3453 ,3443
180 DATA 1823
```

End of listing.

As you move the cursor bar from file to file the length of the file (number of bytes) is displayed in this position. This value reflects the number of bytes the file actually uses, plus whatever terminating or data bytes the file needs. For example, the end of a BASIC file is marked by two binary zero bytes. Therefore a BASIC file that is totally empty will still show a length of two. The end of a TEXT file is marked with a 1A (decimal 26) byte. An empty TEXT file will show a length of one. The first six bytes of a machine language file tell its start address, length and entry address. This amount is added to the length of a CO file.

When the cursor bar is over BASIC, the length of any unsaved BASIC file is shown. When the cursor bar is over TEXT, the number of bytes in the PASTE buffer is shown. If BASIC or TEXT have been made invisible, the first two ROM files will give these values. If all ROM files have been made invisible, these two values won't be shown. If you use the Disk Video Interface from Radio Shack you will be pleasantly surprised to find that when *Men-u-tility* is active and you are using the CRT, the menu will appear on the CRT instead of the LCD.

THE FUNCTION KEYS

F1 - Name

To rename a file, move the cursor bar over the filename you want to change and press *F1*. The bottom line of the display will disappear and you will be prompted with: *Name as?*

Type in any six characters and press *ENTER*. Do not type the extension! All lowercase letters will be converted to uppercase. If you decide not to rename the file, press *SHIFT* and *BREAK* to cancel the prompt. You can rename any file, even the ROM files, (*BASIC*, *TEXT*, *TELCOM*, etc.). If you type more than six characters, only the first six will be used. You cannot change the extension of the

filename. If you type the extension it will be considered part of the filename, i.e., if you try to rename *TEST.DO* and you type *T.DO*, the file will end up being named *T.DO.DO*.

F2 - Kill

To kill a file, move the cursor bar over the filename you want to delete and press *F2*. The bottom line of the display will disappear and you will be prompted with: *Sure?* This is a precautionary measure to keep you from killing a file inadvertently. Type *Y* or *y* to kill the file, type *N* or *n* to cancel the prompt.

F3 - Prnt

To print a file on your printer, move the cursor bar over the text (*.DO*) file that you want to print and press *F3*. The bottom line will disappear and prompt you: *Left? (0)*

This sets your left margin. To use the default value of zero, press *ENTER*, otherwise type the value you want for the left margin and press *ENTER*.

The next prompt is *Width? (80)*

This sets the maximum width of the text on the page. To use the default value of 80 just press *ENTER*, otherwise type the width you want and press *ENTER*.

The next prompt is *Top? (3)*. This sets the margin at the top of the page. To use the default value of three lines just press *ENTER*, otherwise type the top margin you want and press *ENTER*.

Bottom? (3)

This sets the margin at the bottom of the page. To use the default value of three lines, press *ENTER*, otherwise type a new bottom margin and press *ENTER*.

Page length? (66)

This sets the page length. This value should be equal to the number of lines per page. Either press *ENTER* to use the default value of 66 lines per page or enter another value and press *ENTER*.

To cancel the print function, press *SHIFT* and *BREAK* at any of the 5 prompts. Once printing has started you can abort the job in the same manner. *Men-u-tility* checks to see if your printer is ready. If the printer is not ready pressing the *F3* key will simply cause a beep.

```

11FFF521*1665*0603CD693421*1582*2200F63EC332FFF52ADAF2?
*1715*2ADCFA22*1717*21*1890*22DAFA21*1883*22DCFA21*46*2252F6
E5CD795A3AFADF3238F6CD3F42CD125A3E20E7E7E72AB2FBEB2A78F67D93
6F7C9A6701F2FF09CDD43921A1FD22D7FD06363EFFCD0B4F210000111E5B
1AB7CA*127*4FD5CD7059D113C3*112*7/D3D32EFFDFE17CA*155*CDC959
E5211A5BCD585AE12C7DFE18C2*137*9732D9FD32EEFD32AFFACD*942*CD
*250*21*259*CD585A3A*1842*B7C4*1862*CD705DCD4272FE0DCA*355*
FEB7CA*1686*FEBDCA*1727*FE09CA*954*FE20CA*428*FE08D2*430*21
*232*3C3D2323C2*224*CDE45AE9*652**715**970**1719**862**899*
*825**1763*210801CD7C42C35D424E616D65204B696C6C2050726E7420
496E7669204461746520446179202054696D6520416C726D2000CD*630*
E56FCDC9593E44CD7042E1232323EB2185F6CDAD593E20E72185F606097E
B7CA*343*E72305C2*332*0405C83E20E7C3*344*CD2942CD*630*7EFEA0
C20C59CD*250*21*398*CD585ACDCB12CDE90FFE43C8FE4ECA0C59FE59C2
*352*CD*1692*C30C5952656D6F7665204D656E2D752D74696C69747920
28592F4E2F43293F20003E1CF53AEFFD5FF1D61C21*184*E5F8FE05D0B7
01*472*C5CA*500*3DCA*491*3DC1CA*484*7BC604573AEFFDBAF8D5CD
*300*D17A32EEFDC3*942*7BD60457F8C5C97B3D57F03AEFFD57C97B3C57
3AEFFDBA7AF09757C9CD*630*7E010000FE80CA*561*FEC0CA*603*FEA0
CA*617*3AEFFD3DFA*558*CA*600*210000E5210123CD*253*E1C3D43921
99F9CDE35A2B7EA7CA*575*2303C3*565*E5237EB7C2*588*237EB7CA
*592*E1C3*570*E10303C5E1C3*547*21A4F9CDE35A037EFE1ACA*595*23
C3*606*CDE35A23CDE35A0E0609C3*547*3AEFFDF5219FFD3C3D2323C2
*638*CDE45AF1C9CD2942CD*250*21*702*CD*930*D8237EB7CA*649*E5
CD*630*23232306063E20E5CD0B4FD1E10606CDE80FB7CA*701*12231305
C2*687*C94E616D652061733F2000CD294221*781*2252F6CD*250*21
*787*CD585ACDCB12CDE90FFE4EC8FE59C2*712*CD*630*7EFE0CA*712*
FE80CA*794*EB1313132185F6E5362223CDAD5923AF77E13E22C3911FCD
4621C3*46*537572653F2000E5210080227CF621AAFF3602233658232336
0DE1C1C3*758*21*46*E5CD294221*818*CD*936*21*844*CD*930*D8CD
*924*C3B01948483A4D4D3A53533F200021*46*E5CD294221*855*CD
*936*21*881*CD*930*D8CD*924*C3BD194D4D2F44442F59593F200021
*46*E5CD294221*892*CD*936*21*918*CD*930*D8CD*924*C3F1194461
793F200036222B36DDC9CD585AC344462252F6C3*250*CD6942CD*300*
CD6E42C3*512*CD5E1EC3*184*E5C32942CD2942C3*184*CD*630*7EFE0
C2*964*DBBE606EE02C2*964*CD*250*21*1516*CD*930*D8CD*1450*21
*988*DA*960*C2*1011*AF32*1506*CD*250*21*1527*CD*930*D8CD
*1450*21*1014*DA*960*C2*1038*3E50B7C2*1046*37C3*1027*32
*1507*CD*250*21*1559*CD*930*D8CD*1450*21*1049*DA*960*C2
*1073*3E0332*1508*CD*250*21*1569*CD*930*D8CD*1450*21*1076*DA
*960*C2*1100*3E0332*1509*CD*250*21*1540*CD*930*D8CD*1450*21
*1103*DA*960*C2*1169*3E42C3*1169*32*1510*21*1493*2252F62175
F63601AF32*1511*CD*630*CDE35A22*1512*CD*1436*CD*1220*CD
*1187*C3*1160*F521*1508*7E238647F104B8D2*1130*37C3*1116*21
*1511*E53421*1508*7E238623477E90E1BECA*1208*C9CD*1430*CD
*1436*21*1511*3600C90E003A*1507*472A*1512*7EFE0DCA*1345*FE1A
CA*1360*FE09CA*1250*FE20DC*1342*2305C2*1229*3A*1507*81472B05
CA*1297*7EFE20C2*1260*2B22*1514*E5CD*1398*CD2242E123237EFE0D
C2*1293*232322*1512*C93A*1507*8106004F2A*1512*092B22*1514*CD
*1398*CD22422A*1514*237EFE0DCA*1336*FE20CA*1337*C3*1338*2323
22*1512*C90C04C92322*1514*CD*1398*2A*1514*2322*1512*C92B22
*1514*EB2A*1512*DFDC*1398*21*1510*7E23962B2B2B96F5CD2242F13D
C2*1382*2175F63600E1C9CD*1416*2A*1514*EB2A*1512*7EE7DFC823C3
*1408*3A*1506*B7C8F53E20E7F13DC3*1419*3A*1509*C3*1439*3A
*1508*B7C8F5CD2242F13DC3*1439*2306007EB7CA*1474*CD*1467*D804
23C3*1453*FE30D8FE3A3FC9AFB8C82185F6CDEB081415C2*1491*7B14C9
37C9CD2242AF3275F6CDBC12C3*46*00000000000000000000000000000000
2830293F2000576964746820283830293F200050616765204C656E677468

```

Listing 2. The *TEXT* file that contains the code for *Men-u-tility*.

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TS-DOS/TS-RANDOM

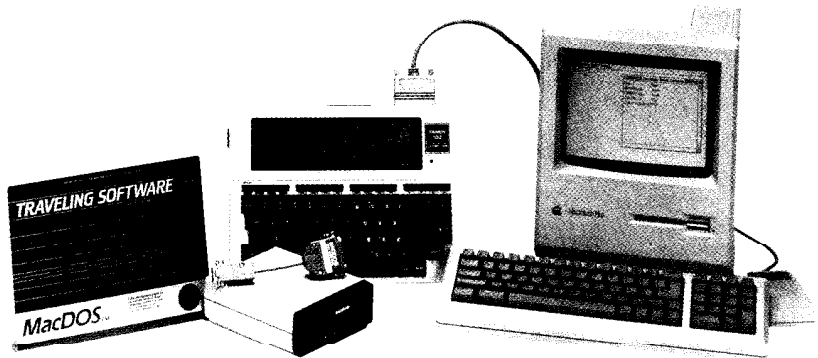
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POWERCELL

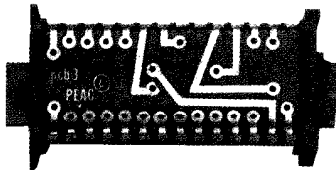
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SARDINE Disk	RS1-SD1	RS1-SD1	RS3-SD1	NE1-SD1		
SARDINE ROM Chip	RS1-SD2	RS1-SD2	RS3-SD2	NE1-SD2		
SARDINE 4 ROM Set for Booster Pak	RS1-SD3	RS1-SD3				
MAC-DOS II	AP1-MD1	AP1-MD1	AP1-MD1	AP1-MD1	AP1-MD1	
LAP-DOS II	PC1-LD1	PC1-LD1	PC1-LD1	PC1-LPD1		PC1-LD1
POWERCELL	HW1-PP1	HW1-PP1	HW1-PP1	HW1-PP1		
8-ROM EXPANSION PAK w/SARDINE PLUS w/TS-DOS	RS1-SD4 RS1-TS3	RS1-SD5 RS1-TS4	RS3-SD3 RS3-TS3	NE1-SD3 NE1-TS3		
TS-DOS Disk	RS1-TS1	RS1-TS1	RS3-TS1	NE1-TS1		
TS-DOS ROM Chip	RS1 TS2	RS1 TS2	RS3 TS2	NE1 TS2		
ROM2/CLEASEAU ASSEMBLER	RS1-CL1	RS1-CL1	RS3-CL1	NE1-CL1		
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Printer Control with the Tandy 600 Laptop Computer

*A program to educate your printer
by Dennis C. Rogers*

I developed this program for a close relative who wanted to control the mode of his printer. He was using a Tandy Model 600 and a Tandy Model DMP-130A printer and complained that the printer manufacturer had not provided him with enough data. He had a long list of things that he wanted his printer to do: He wanted to print in draft mode, in NLQ mode (near letter quality), normal mode (10 CPI), compressed mode (17 CPI) and he wanted to be able to select the elongation printing. There was more.

Since there are many models and each has to have its own custom program, I welcomed the opportunity to show 600 user's and others how easy it is to write a simple program to accomplish these tasks. I wrote the program in *BASIC* to make it easy and adaptable to any printer and computer on the market. *DMP-130A.bas* is a generic printer control program, able to select multiple printer modes in a menu-driven type of selection. This makes it very simple for the end user.

If you wish to enter the program by hand from the magazine article, do NOT use the internal program *WORD* as this is not compatible with the text format within *BASIC*. Instead, you should use *BASIC* itself, but remember to enter the line numbers before each and every line and

check for syntax.

Another means for executing this program is through *BASIC* while logged onto drive A: on the Model 600. This would not pose a problem for the execution of the program while logged onto drive A:, but it will return you to the virtual (RAM) disk upon exiting back to *HHOS* operating system. You can log onto a 3.5-inch diskette by depressing the F3 function key. If you depress F3 function key again you will return to virtual memory disk.

*I wrote the
program
in BASIC to
make it easy
and adaptable.*

UNDERSTANDING THE PROGRAM

At this time, I will attempt to explain each line of *BASIC* code in the source code listing. Starting with line number 100 through 250 is the ASCII (') which is an abbreviation for *REMARK* statement. This is used as a means for documenting your program for version, date, author, title

and so on. These statements are NOT executed by *BASIC*, but do serve their purpose in the language.

If you modify this program, keep these lines intact. You can add your revision date, name and comments if you wish.

At line number 260, *DIM A\$(12)* is used to dimension a string array *A\$* with twelve string elements associated with the array. Line 270, contains the statement *CLS* which is known as the statement to clear the screen. In the next line 280, we are defining the contents of the first element in the string array *A\$* with the statement as shown. Note, the in-line remark statement which documents the string's function as to the printer's mode when executed.

Let's take it a step further by explaining the code embedded into this particular string. The *A\$(1)* denotes the first element of the string array *A\$*. The next is a *BASIC* function which converts a decimal number (ASCII equiv.) of a *ESC* to a character string. In turn, it is appended onto yet another string which converts a decimal number (19) to a character string.

Then, it is stored into string array *A\$* as one continuous string for retrieving at a later time in the program. In each of the following lines from 290 to 390 the same applies as above; except, these strings are individually stored in their own file

TANDY 600

drawer. Each one from there on can be called up by *A\$(3)* which means the third string element in array *A\$* or *A\$(7)* which means the seventh.

In as much as we have defined all memory variables needed at this time, we will move on to the next and definitely most used *BASIC* statement of all, the *PRINT* statement. As we look at line 410 in the listing, we see a *PRINT* statement which does nothing more than print to the console (CRT/LCD) display the contents embedded in the double quote marks. This is the simplest *BASIC* statement in its simplest form. This also applies to the same syntax using the *LPRINT* statement in *BASIC*. This is true for the following lines from 410 to 490. In line 500, the stand alone *PRINT* statement simply outputs to the console device a carriage return and a line feed to bump the screen up one line or to skip a line.

In line number 510, we have multiple statements separated by a colon (*BASIC* separator) for two or more statements on the same line. For the first statement, you should refer to your *BASIC* User's Guide which came with your Tandy Model 600's *BASIC* ROM kit. It will describe the arguments behind the statement *LOCATE*. This defines the row and column and size of the cursor position after executing this statement. This will in turn tell where the *S* in the following *PRINT* statement will appear position-wise on the console screen. This will also determine how far over to the right the cursor will end up after printing the entire string in the print statement "*SELECTION DESIRED*". This *LOCATE* statement is the most user friendly command *BASIC* could give to the *BASIC* programmer.

In the next line following (line 520) is one of those simple but handy routines which does nothing more than an ASCII backspace and character rub-out five times. This erases only the entered numerical selections without affecting the rest of the display.

In line 530, the first statement again sets the cursor position on the screen. Then, in the next statement, the program requests an input from the user for the selection desired. Within this statement, the semicolon in front of the variable (*V*) causes the program to not output a carriage return and line feed to the console screen. In the next statement the variable (*V*) is used to determine if the user is going to exit the program or continue. If 0, the user will exit by branching to line number 600. If he doesn't exit, he will proceed to the next line numbered 540.

In line 540, there are checks to see if the variable is greater than twelve or less than zero. If it is one of these, you branch to line 510 which prompts the user again for another selection. If the input is within the range of one to twelve, we output the appropriate printer mode string to the printer.

In line 560, we have a delay routine for the printer to play catch up with the computer. After the printer says I am ready for more, (in line 570) the user is informed of the selection made. Then, he is prompted again for another selection to be made with the statement in line 570 of *GOTO 510*.

In lines 600 to 630, the user is informed he is exiting the program "*DMP130A*" while the computer shuffles back to the system manager. That is all there is to it.

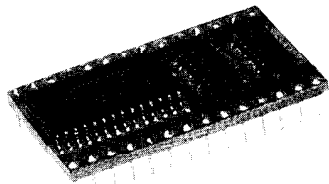
```

100 '-----
-----
110 '          TANDY DMP130A P R I
N T E R   S E T U P
120 '
130 '          E A S Y   W A R E
P R O D U C T S
140 '          P.O. Box
218778
150 '          Houston, Texas
          77218-8778
160 '
170 '      Author - Dennis C. Rogers
180 '      Version - 1.00
190 '      Date - 3 Jan 1988
200 '-----
-----
210 '          COPYRIGHT 1987 EAS
Y W A R E P R O D U C T S
220 '          A L L   R I G H T S
R E S E R V E D.
230 '-----
-----
240 '
250 '
260 DIM A$(12)
270 CLS
280 A$(1)=CHR$(27)+CHR$(19)' 10 cpi (
normal print)
290 A$(2)=CHR$(27)+CHR$(18)' 12 cpi (
near letter quality)
300 A$(3)=CHR$(27)+CHR$(20)' 17 cpi (
compressed print)
310 A$(4)=CHR$(27)+CHR$(66)+"1"
' select italics
320 A$(5)=CHR$(27)+CHR$(31)' select bo
ld characters
330 A$(6)=CHR$(27)+CHR$(32)' cancel bo
ld characters
340 A$(7)=CHR$(27)+CHR$(58)' select IB
M character set
350 A$(8)=CHR$(27)+CHR$(59)' select TA
NDY character set
360 A$(9)=CHR$(27)+CHR$(14)' select el
ongation
370 A$(10)=CHR$(27)+CHR$(15)' cancel e
longation
380 A$(11)=CHR$(27)+CHR$(17)' set prop
ortional characters
390 A$(12)=CHR$(27)+CHR$(66)+"0"
' cancel italics
400 '
410 PRINT "          Tandy Model D
          Continued

```

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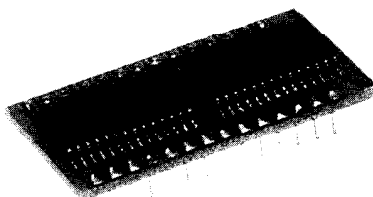
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MODIFYING THE PROGRAM

To modify the program to work with an Tandy DMP-106 dot matrix printer rather than the Tandy Model DMP-130A printer a simple revision of the program is explained. Remember to always work from a backup copy of the program so that you don't destroy the original copy. It is also handy for a reference during the debug process.

Start by modifying line number 280 or string array element two. Change line 290 and line 380: 290 A(2) = CHR$(27) + CHR$(23) ' 12 cpi$ and 380 A(11) = CHR$(27) + CHR$(80) + "1"$

Because the Model DMP-106 printer does not contain the set-and-cancel italics modes, you can change these functions to any other function you may desire. This will affect both the menu and the followings line of code.

310 A(4) = CHR$(27) + CHR$(66) + "1"$

390 A(12) = CHR$(27) + CHR$(66) + "0"$

In the menu, lines 470 and 490 would need to be changed to reflect the new function mode descriptions. Any other changes for other printers could be made as simple as this. Also, the number of selections could be increased just as simply as you have modified them.

BASIC'S BINARY SAVE/LOAD SAVINGS

You can save any BASIC program in RAM or on disk by assigning it a filename. The filename must be enclosed in quotation marks: $SAVE "A:filename.bas"$

You can also save the file in RAM: $SAVE "filename.bas"$

This will save the program specified in RAM and displays the filename on the menu when you exit BASIC. After this process has completed, BASIC will display the prompt OK.

Note: If you do not assign a filename to your program when you exit BASIC, the computer automatically saves the program under the filename *WORK.BMI*. When you re-enter BASIC and do not specify a filename at the "file to load" prompt, the computer loads the contents of *WORK.BMI* into memory.

Another approach to saving files in BASIC is to either save the filename specified in ASCII format to the RAM disk or floppy disk drive by typing: $SAVE "filename.bas", A$ and pressing ENTER.

The comma and "A" following the filename specifies that you desire the file to be saved in the ASCII format rather than the usual binary format. In this format, ASCII, you can edit the program with any text editor or screen editor on the market. Also, this is the format you will want to save in, to be able to transfer it to any BBS (Bulletin Board System). This will be in the *UPLOAD* mode of the BBS. The disadvantage to this format

is that it takes longer to *LOAD* the program through *BASIC*.

Next, we will take a look at the protected *BINARY* format of a *BASIC* saved file. Transferring files in *ASCII* format is for the *XON/XOFF* protocol only. It is better to transfer under the *XMODEM* protocol as it accepts the binary format. The binary takes less time as it is a 30 percent savings in file size over the *ASCII* format.

In the Protected Binary format, the file is saved in an encoded binary format. When a protected file is later run (or loaded), any attempt to list or edit it fails. The only operations that you can perform on a protected file are *RUN*, *LOAD*, *MERGE*, and *CHAIN*. Here are some examples: *SAVE "A:DMP130.bas",P* or *SAVE "A:DMP130",P* or *SAVE "DMP130.bas",P* or *SAVE "DMP130",P*

In the first example above, you will be saving the file to floppy disk drive on the Model 600. In the second you never need to specify *.bas* extension to a *BASIC* program if you desire it to default to *.bas*. In the third example the file is saved to *RAM* memory disk (virtual disk technically) in the protected mode. As before, the fourth example shows you do not need to specify the extension *.bas* as a means of saving when typing. The compressed or binary format takes less space than *ASCII* format. Also, *BASIC* can save and load in compressed format faster than in *ASCII* format.

CONCLUSION

Obviously, this program could take on many new functions for your printer. I will help you out if you get into a corner. Mail the problem to me. Supply the listing of the program you have typed in and a return envelope and postage. The fee I have suggested at the end of the article only covers my expenses in helping those people who "want to afford" the problems which may occur.

Also, I can offer other manufacturer's printer setups. Contact me in writing specifying printer vendor, model, and parallel or serial connection to the Model 600 or any other Microsoft *BASICA* based microcomputer on the market. This program will run on all *DOS* based microcomputers.

The *DMP-130A* program is available on 3.5 inch Tandy Model 600 (or on 5.25-inch or 3.5-inch *PC* compatible) format for \$10. Write to the address below specifying the article title with money order enclosed and return address.

If you want to order the diskette or get on a mailing list for 600 or *PC* compatibles users, phone.

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(713) 933-0542

```
MP-130A CONTROL"
420 PRINT "                               ==> Type 0
to Exit <===="
430 PRINT
440 PRINT " 1) Set 10 CPI (DRAFT)
7) Select IBM Character Set"
450 PRINT " 2) Set 12 CPI (NLQ)
8) Select TANDY Character Set"
460 PRINT " 3) Set 17 CPI (Condensed)
9) Start Elongation"
470 PRINT " 4) Select Italics
10) End Elongation"
480 PRINT " 5) Select Bold Character
11) Set Proportional Characters"
490 PRINT " 6) End Bold Character
12) End Italics"
500 PRINT
510 LOCATE 11,1,1:PRINT "SELECTION DESIR
ED ";
520 FOR I=1 TO 5: PRINT CHR$(29): NEXT
I
530 LOCATE 11,20,1:INPUT ;V:IF V=0 THEN
600
540 IF V>12 OR V<0 THEN GOSUB 580:GOTO 5
10
550 LPRINT AS(V):CS::CS=""
560 FOR I=1 TO 200:NEXT I:GOSUB 580
570 PRINT "(CODE";:PRINT V;"WAS ENTERED)
";:GOSUB 590:GOTO 510
580 PRINT
590 RETURN
600 '*** EXIT ***
610 PRINT " Tandy Model DMP-130A S
etup Program Concluded.";
620 PRINT
630 SYSTEM
```

End of listing.



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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."

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The Tandy Model 100 and Data Security

With An Encrypting Program
by Scott T. Schad

Have you ever wished that *TEXT* files in your portable computer weren't so easily accessible? What about your on-line communications? Just how secure is electronic mail? *CRYPT.BA* is a short *BASIC* program that should restore some peace of mind.

Data security in a Tandy Model 100 is a several-stage procedure. The most effective front-line defense is to simply carry the computer with you at all times and lock it in a desk or briefcase when you don't need it. If this isn't practical, you should make it as hard as possible for someone else to use it if they find it. One technique which will stop most intruders is to disconnect your printer and execute "CLS : LCOPY" from *BASIC* before turning your Model 100 off. No matter how many times a person turns the computer on and off afterwards, he will be greeted by a blank screen and a non-responsive keyboard. Either a *SHIFT+Break* or a *RESET* is needed to snap the computer out of it. The *RESET* button on a 102 is recessed on the back and colored black like the rest of the case... so it is easy to overlook. The *BREAK* key is obvious, but you can rub the label off or put a CLUB 100 sticker over it like I do, so no one knows it exists. The only other option is a cold start, which removes your files anyway.

But any determined meddler will eventually defeat your front-line security. *CRYPT.BA* is an extremely short *BASIC* program that you can use for your last line of defense.

When you run *CRYPT.BA* it asks whether you wish to Encrypt or Decrypt a text file. If you press "E:", a list of all text files in *RAM* is presented and you are asked to choose one. Then you give a destination name for the file after it is encrypted. As the coding process proceeds, you see the text of the file scroll across the screen. When it is complete, the old file is *KILLED* off and only the new, encrypted one remains in memory. You can now send the encrypted text file by modem, or store it on disc or tape in coded form.

To decrypt you run the program again, answer "D" to

Fig 1. Listing for *CRYPT.BA*

```

=====
0 'CRYPT.BA (c) 1988 Scott T. Schad
10 MAXFILES=2
20 PRINT "Encrypt/Decrypt?"
30 Q$=INPUT$(1)
40 IF INSTR("Ee",Q$) THEN Q$="E":PRINT "Encrypt" ELSE
   Q$="D":PRINT "Decrypt"
50 FILES:INPUT "Source file";F1$
60 OPEN F1$ FOR INPUT AS 1
70 INPUT "Destination file";F2$
80 OPEN F2$ FOR OUTPUT AS 2
90 IF EOF(1) THEN 140
100 A$=INPUT$(1,1)
110 PRINT A$;
120 IF Q$="E" THEN PRINT #2,CHR$(ASC(A$)+127); ELSE PRINT
   #2,CHR$(ASC(A$)-127);
130 GOTO 90
140 CLOSE 1 : CLOSE 2
150 KILL F1$+".DO"
160 END
=====

```

A neat little program to encrypt your files.

the initial prompt, give the encrypted file name as the source file and a new name for the destination file. You will see lots of graphics characters scroll across the screen as the program runs, and will be left with just the decrypted file in *RAM* at the finish. And don't worry about accidentally encrypting an already-encrypted file—you'll get an immediate function call error before any damage is done.

How does *CRYPT.BA* work? It takes each character of a text file, converts it to its ASCII value, adds 127 to that, and converts it back into a symbol with the *CHR\$* function. This jumps normal text characters up into the 8-bit range and turns a file into a meaningless jumble of graphics characters.

Using 127 as the coding factor is purely arbitrary, just a convenient choice for this example. Since it forces the use of 8-bit (high-order) graphics characters, you will only be able to transfer files so encrypted via modem by setting your *STAT* parameters to use 8-bit words (like *M8N1E*).

But what about vendors like CompuServe, who use 7-bit words? How can you encrypt a file and send it through

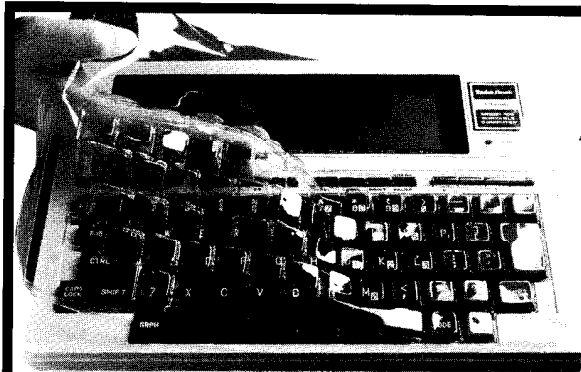
CompuServe E-mail? Simply change the 127 value used in coding to something much lower, like 10. This will keep the encrypted characters out of the graphics range, and representable by 7-bit words.

You can also get much more elaborate with your encryption procedures. *CRYPT.BA* uses a simple arithmetic offset to modify the ASCII values, which could be discovered by a determined code-breaker. But what if you broke apart the file into 5-letter groups, and added a different number to each ASCII code of the group, repeating the process each time a new 5-letter group was read? That would complicate the code quite a bit. You can also embed meaningless characters in an encrypted file according to some predetermined pattern, or tie the coding number added to the ASCII values to a mathematical function. For the ultimate in security you can split a source file into two or more encrypted component files, with alternating characters printed to each one.

The point is that you should modify *CRYPT.BA* to use your own, secret coding procedure as your needs warrant. Just remember that *CRYPT.BA* needs enough room in memory to load a file of duplicate size to the source file, even though the source file is deleted when the program ends.

One last note: it won't do much good to encrypt all your files if you leave *CRYPT.BA* clearly visible on the main menu. I suggest you type the *CRYPT.BA* source code into *BASIC* as the working program, and don't save it under a name. That way there is no sign it exists, and the only way to invoke it is by entering *BASIC* and pressing *RUN*. Or don't put the *CRYPT.BA* program in *RAM* at all... just carry it with you on a piece of paper and type it back in when needed.

Now you can keep your *ADRS.DO* file, passwords, credit card numbers, checkbook register, resume, hot news tip, or secret recipes safe from prying eyes. And your on-line messages will be much harder for a nosy sysop to read. □



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The Budget Bank Update

Corrections To The Chip Construction Project

*written by Paul Globman
developed by James Yi*

Iwould like to apologize for last month's article about installing a slightly modified RAM chip in the Tandy 200. I thought the construction project complete.

It was earmarked for publication in the June issue, which left adequate time for thorough testing. Somehow the article was pushed up into the May issue and when I called Portable 100 to advise them of newly discovered problems, I was told that it was too late to "pull" the article.

The fix requires installing a 2N3904 transistor, a 10K ohm resistor, and a 4.7K ohms resistor (per bank).

First, see if you can identify the three terminals of the transistor, Emitter, Base, and Collector. Looking at the transistor's flat side, the Emitter is the leftmost pin, Base is the center pin, and the Collector is the rightmost pin...Then follow this procedure for each chip (see diagram):

- 0) Before soldering the wires together, plan how you are going to lay the parts in the memory compartment, and prepare proper length of wires.
- 1) In addition to the prior modification, bend out pin 20 so it does not enter the socket.
- 2) Do not insert the pin 22 wire to socket's pin 20. Instead insert the wire to socket's pin 14. If the wire doesn't reach, substitute a longer piece of wire.

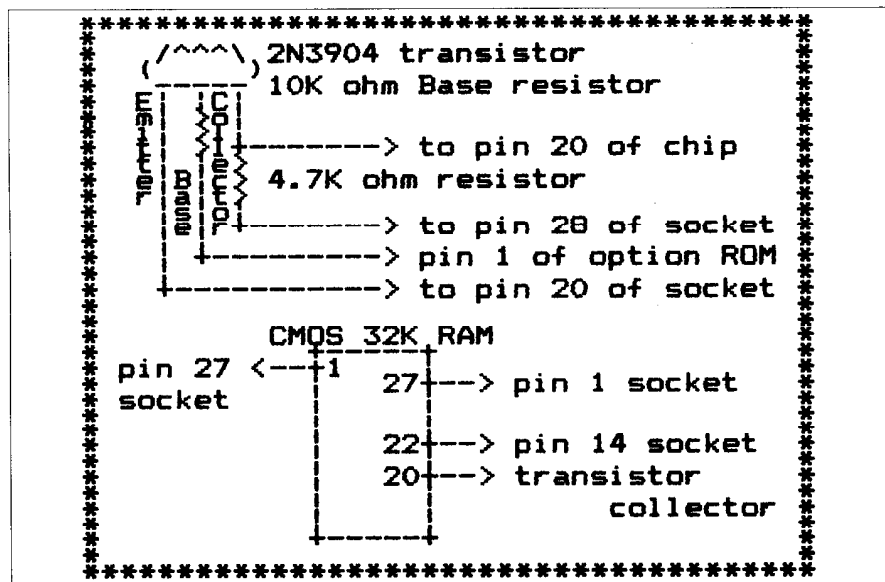


Figure 1. Modifications required for the RAM chips in The Budget Bank (see May issue).

- 3) Then connect the transistor's collector to chip's pin 20.
- 4) Also connect one end of 4.7K ohm resistor to chip's pin 20.
- 5) Connect the other end of 4.7K ohm resistor to the socket's pin 28.
- 6) Connect the transistor's emitter to the socket's pin 20.
- 7) Connect one end of 10K ohm resistor to the transistor's base.
- 8) Connect the other end of 10K ohm resistor to option ROM's pin 1 (+5V power supply, located at the lower left hand corner, as you position the computer so that 32k chip's labels look upright.), care-

fully, so that it doesn't interfere with inserting and removing the option ROM.

- 9) Make sure that bare wires or component leads do not touch any pins or terminals, and secure the components with tape or glue.

This fix makes the project a bit more complex and perhaps not for the average Portable 100 reader, but a good project for the hardware buffs, or the bold and curious!

Again our apologies for any problems that our collective enthusiasm in publishing the article may have caused. □

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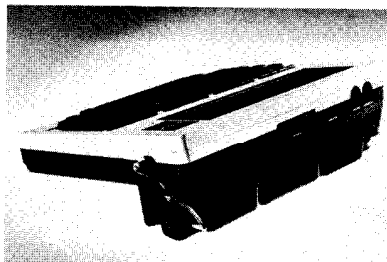
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about Tandy Notebook computers.**

*Send your queries to: Terry Kepner, DEFUSR, c/o PORTABLE 100,
P.O. Box 428, Peterborough, NH 03458-0428.*

Please enclose a stamped, self-addressed envelope for Terry's reply.

GARBLED FORM, HELP!

Having a Tandy 3000-HL and a Model 100, I decided to get a null modem and cable to connect the two. I want to upload documents I write on the portable to the PC where WordPerfect can finalize them. Both computers are set to the same parameters and the transfer of data occurs using the TELCOM feature on the Model 100 and COPY COM 2 filename on the PC.

However, all the text runs consecutively. None of the carriage returns ENTER at the end of paragraphs in the Model 100 text files transfer to the PC. The result is a lot of work trying to reconstruct the documents back to their intended form.

Is this normal, or am I doing something wrong?

**Douglas C. Pizac
San Dimas, CA**

Type POKE 63066,1 and that will take care of your problem. Carriage returns will automatically have linefeeds added to them as TELCOM sends the file. Unfortunately, the reverse isn't true.

-TK

**USING THE 100 AFTER
THE AUTO-AFTER MARKET**

I have enjoyed Portable 100, and your March issue was no exception.

I had used my 100 in ordering parts in the Auto-after Market. The 100 was programmed by the vendor, IPL program, and I did not receive the manual on it. When I closed the

stores, I had two 100s and only a very basic idea of how to use them. I, after many months, found a book by David R. Lien. Great, I thought I could now start understanding the workings more. Even without the book I was writing simple programs.

I have gotten a video-disk interface (5.25 inch disk), but there are no

*Your problem
is a clash
between the DOS
and your
tape programs.*

programs in this size disk, at least none that I have found. Do you know of any source?

I am having problems with the interface and machine language. The .CO files load from tape fine, but if I try to run them the 100s locks up. I can only cold start as reset or turning off the system (100s and disk drive) has no effect. I believe the .CO files are being placed in the same RAM space as the disk operating system. Do you or any of your readers have a

program or other help available? I do not have a book on the machine language and do not understand how programs are written in it. I do not believe I can just save the .CO files into another area of memory without changing lines (?) in the program itself. Any help you or your readers can give would be appreciated.

**Dennis W. Hagon
Owosso, MI**

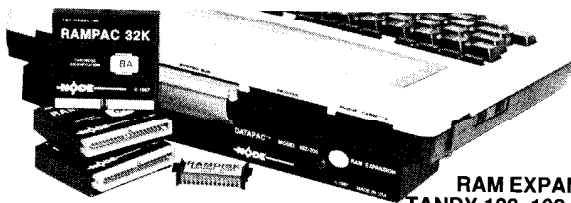
Your problem is definitely a clash between the disk machine-language control program and your tape machine-language programs.

The only cure is to not use them both at the same time. You must exit the disk operating program, remove it from memory, then load your tape programs.

You can, however, save the programs on the disks by first loading them into memory (making note of the start, end, and exec. addresses) then saving them using the SAVEM "filename" start, end, exec command. Now reset MAX RAM with the CLEAR command and start the disk system. You should be able to store the programs on disk using the Disk Operating System to move the .CO files.

To use them you would copy them from disk to RAM, turn off the D.O.S., set high memory to the correct value, and execute them by putting the cursor over the filename and pressing ENTER. Hope that helps.

As to programs for the video-disk interface unit, I'm not aware of any commercial programs available at the



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moment. Sorry. Does anyone know of a source of these programs?

-TK

WHAT'S UPLOAD AND DOWNLOAD?

I read with interest and sympathy Ms. Legeza's letter in the February '88 issue of your magazine. I hope you will give serious consideration to her sentiments, that the magazine will have a balanced mix of articles and text, some of interest to the veteran users of computers, and others of value to the novitiates—like me—who barely know the difference between upload and download, and in my case, haven't figured out how to do either.

I bought a Tandy 102 to use for note taking in my class after the salesman assured me that with a null modem it could be made compatible with my Macintosh Plus. So I bought the laptop... and the null modem... and a data cable to plug into the telephone part of my Mac... and a com-

munications program (Microphone)... and I read the documentation... and I still haven't been able to upload or download a byte.

I went back to the local dealerships

*Everyone assured me
the two
could be
interfaced—
but no one knew
exactly how.*

for the Tandy and the Mac and discovered (surprise, surprise!) that they are better at selling me their products than helping me use them. Everyone assured me the two could be interfaced—but no one knew ex-

actly how. I have yet to develop a support group or plug into a network of hackers who might be able to solve my problem.

Uploading and downloading may be old hat to many, if not most, of your readers, but every week scores of new users are coming on line for whom the simplest fundamentals are incomprehensible and, therefore, insurmountable hurdles. I hope you will not neglect to review the fundamentals from time to time so that people, such as myself, can get past square one, and square two and into using and enjoying the many capabilities of these splendid gadgets.

**D. Paul Granke
Pasadena, CA**

First, you need the Macintosh Plus-to-modem cable sold by Apple (a round DIN connector to DB-25 connector). The second item you need is a null-modem, which you apparently already have.

Plug the modem cable to the MAC, then plug the null modem to the cable, and finally, add your Tandy to the end of

the line.

Now then, I've tried to use Microphone with my Tandy 100 without success. So I switched to Red Ryder and can now easily transfer data both ways.

Set your Red Ryder to 300-8-N-1 (300 baud, 8 bit words, No parity, 1 stop bit). Set your Tandy TELCOM STAT to 38N1E. Now you can use the Tandy's UP (F3) to upload a file (select Capture File to buffer on the MAC to save it). When finished, shut off the Capture option (.DO not try to use X MODEM).

To download, reverse the procedures. Good luck

-TK

RADIO SHACK LOANS ME 100s

I'm a high school physics teacher, I write a lot, and I prepare most of my text on my portable. I don't own a Model 100/102. I do my portable computing on a NEC 8201. The study guides, and papers I've written are equivalent to several books. Although I'm not a hacker, I write and use BASIC programs to solve problems and grade student labs.

I'm so sold on portable computers that I offer free workshops to teach other educators how to use them. Local Radio Shack managers have helped by loaning me Model 100s and 102s for my classes.

I'd like to be able to use my portable as an attendance record and grade book. Ideally, I want to enter information in a data base format and generate reports using the word processor. I have experimented with Ultimate ROM II but, although the functions are handy, T-base doesn't seem to fit this application, and UR11's machine language requirements mess up my ability to transfer files among banks.

It would also help to have a program to read the positions of and, if possible, conveniently relocate the offending machine language programs (I probably display my ignorance here!).

Thanks for your ear!

**F. Charles W. Heil
Portland, OR**

While I couldn't find any programs in our files, I did notice (while pasting up the magazine) that we do have a classified ad this month's selling just such programs. Check it out.

As for moving the .CO files, you can easily store them in memory by loading and saving them using the LOADM and SAVEM commands. When you type the LOADM command watch carefully as the program loads. You'll see three lines of information listed: start, end, and execute. Note down these three numbers. After the program finishes loading, type SAVEM "filename", start, end, execute, substituting the numbers appropriately. This will put a duplicate of the .CO file in low RAM.

To execute the file, first set HIMEM to one less than the start address of the file (do this in BASIC), then return to the MENU, put the cursor on the .CO file and press ENTER. When you are finished using the program, exit it, go to

**As for moving
the .CO files,
you can easily
store them
in memory**

BASIC, type CLEAR 256, MAXRAM, and this will remove the program from high memory, preparing it for the next .CO file you wish to use. You can have several .CO files in low memory at the same time without conflict.

-TK

CAN I CONVERT A .DO FILE TO A PROGRAM?

I recently entered a program into my TRS Model 100 computer and after I saved it I noticed that it was a .DO file instead of a .BA program. Is there any way to convert the .DO file to a program. Thanks in advance.

**R. E. Thomas
Queens Village, NY**

Yes. Simply go into BASIC and type LOAD "filename". BASIC will load the file and convert the file to a BASIC program. As each line loads, you will see the "OK" prompt flash.

You might have a slight problem when

loading if you see BASIC give a "DS Error". This means that somewhere in your file is a line that is either too long (242 characters is the maximum length allowed when loading a .DO file), or the line does not start with a line number. The solution is simple: just type LIST and wait for the last line successfully loaded to list. Then go into your .DO file and fix the line immediately after the one that last loaded. If the line is longer than 242 characters, shorten it and give the new section a new line number. Return to BASIC and type LOAD "file" again. If necessary repeat this procedure until the file finishes loading.

The only other problem you might run into is, there isn't enough room for both .DO and .BA files. In that case list your program to see how far it made it. Then go into the .DO file and delete the lines that are already loaded. Return to BASIC and load more of the .DO. Repeat until all of the .DO file has loaded into BASIC.

Don't forget to name your BASIC file and to make sure that the paste buffer is empty and that MAXFILES=0.

-TK

MORE RAM FOR THE 200

I won a Tandy 200 laptop with three banks of 24K. Starting up the 200 only shows 19+K. I would like to know if it is at all possible to gain RAM without having multiplan in all three banks, and without outside extensions.

I would appreciate any advice concerning the gain of RAM, (subscriber).

**Hank Tarta
West Hempstead, NY**

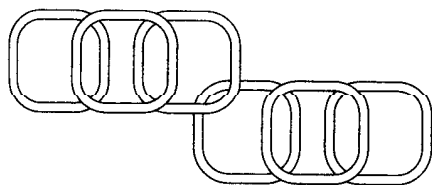
The 19K that you see in each bank is what's left over after the computer subtracts the room it needs for operating information.

The operating information is about 5K and includes such stuff as the 640 bytes used to store the LCD display, the 700+ bytes used for the MENU display, name of the IPL program if any, the date, day, and time, the name of the current BASIC program, and so forth. It's really keeping up with a lot of data.

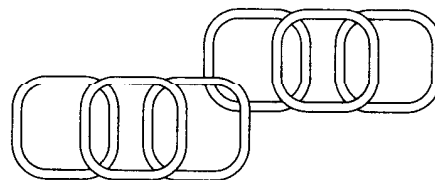
Multiplan doesn't use up any RAM until you create a file using it. Multiplan is a ROM program.

Sorry.

-TK



Program Chaining



Last month I showed you how to display files in all RAM banks at once. That utility was developed by *PEEKing* at data in another bank and putting it to use. This month, instead of adding another function key, I will demonstrate the use of *POKEing* into another bank, resulting in the ability to "chain" or "link" programs in different RAM banks.

The technique I use to chain programs is really quite simple. By *POKEing* into another RAM bank, I can have a running program pre-set the *IPL* (Initial Program Loader) for another RAM bank, and then *WARM START* into that RAM bank. The *IPL* will execute in the new bank, and presto... I have chained to the program of my choice, in the RAM bank of my choice.

Now I am faced with two problems: how do I set the *IPL* in another RAM bank, and how do I *WARM START* into that bank?

SETTING THINGS UP

Setting the *IPL* in another bank is a bit tricky. The *IPL* is set when a valid RAM filename exists at location F4DDH (the filename is followed by a CR and a zero terminator). A total of 11 bytes are allocated for this filename and it occupies memory locations F4DDH (62685) to F4E7H (62695) in each bank.

The most user friendly method I could think of to do this was to implement the *BASIC IPL* statement, followed by a simple *CALL* statement. For example: *IPL"PRGRAM.EX": CALL ADRS,BNK* where *PRGRAM.EX* can be any file or program that exists in the destination bank (including *.DO*, *.BA*, *.CO* files, and built in programs like *TELCOM*, etc.), *ADRS* is the location of the code that will do the task, and *BNK* is the destination bank (1, 2, or 3).

So, by having my *BASIC* program execute the *IPL"filename"* statement, naming the file I wish to "chain" to in the other bank, and *CALLing* a routine that moves an 11 byte block to the *IPL* location in the new bank, I have completed the first part of my task.

WARM STARTing into that bank is another interesting procedure. *WARM STARTing* means "initializing" a RAM bank while preserving all RAM files and various system variables. Location *EEF5H* (of bank #1 only) is

```

;*****
;*   PROGRAM CHAINING (CHAIN.CO)   *
;*   by Paul Globman              *
;*   Copyright (c) 1988           *
;*****
CLR IPL: EQU 1C1AH
MOVDAT: EQU F870H
IPLNAM: EQU F4DDH
NXTBNK: EQU EEF5H
POKE: EQU 9BB0H
WARMST: EQU 0399H
;
;-----
;          ORG 63900           ;alt lcd buffer
;
;          mov b,a           ;this code
;          mvi a,1           ;changes the
chl:       rlc               ;bnk parameter
;          der b             ;into proper
;          jnz chl           ;format (0,4,8)
;          ani 0ch          ;from (1,2,3)
;-----
;          MOV B,A           ;BANK TO CHAIN
;          MVI C,0BH         ;COUNTER=11 FOR
;          LXI H,IPLNAM      ;IPL FILENAME
;          CALL MOVBNK
;
;          LXI H,MOVDAT      ;move 256 bytes
;          CALL MOVBNK       ;for programmer
;
;          MOV D,B           ;GET DEST BANK
;          MVI B,0           ;AND POKE THAT
;          LXI H,NXTBNK      ;INTO EEF5H OF
;          DI
;          CALL POKE         ;BANK #1
;          EI
;
;          CALL CLR IPL     ;CLR CURRNT IPL
;          JMP WARMST       ;WARMST BANK #1
;-----
MOVBNK:   PUSH B             ;save dest bank
;          MOV D,M           ;move data to D
;          DI
;          CALL POKE        ;poke dest bank
;          EI
;          POP B             ;restore BC
;          INX H             ;next address
;          DCR C             ;counter-1
;          JNZ MOVBNK       ;again?
;          RET               ;done!
;

```

Listing 1. The Assembly code for CHAIN.CO

THE CUSTOM 200

used to store the currently active RAM bank. If you *POKE* the new bank (BNK) into EEF5H (bank #1), initiating a *WARM START* in bank #1 will automatically result in a *WARM START* into the new bank.

This bank #1 location (EEF5H) is used when the Tandy 200 is turned on, to decide which bank to go to, and is used with a *WARM START* in bank #1, also to decide which bank to go to. If a zero is not at this address when bank #1 is *WARM START*ed, the Tandy 200 will automatically jump into whatever bank is represented by the byte at EEF5H.

With the code in listing #1 in place at location F99CH (63900), I can *CHAIN* to *PROG3.BA* in RAM bank #3 simply by including the following *BASIC* statements in my program: 1000 IPI. "PROG3.BA": CALL 63900.3

Using this method, I can directly access any program or file from a running *BASIC* program. I can directly access *.DO* files from *BASIC* regardless of what bank they are in.

The *CALL CLKIPL* in listing #1 exits with 0 in the accumulator so a *JMP WARMST* will *WARM START* bank #1 automatically. Because we pre-set EEF5H (in bank #1) to the destination bank, a warm start in bank #1 will, in turn, warm start the destination bank and execute the *IPL*.

TRANSFER BUFFER

In addition, 256 bytes of memory are moved into the destination RAM bank to allow the user to pass parameters, or other data, from one program to another. This RAM area is from 63600 to 63855.

To pass information, 256 bytes of memory are also moved.

The 256 byte transfer was included so the *BASIC* or *ML* programmer can pass information back and forth between *CHAINED* programs. The area from 63600 to 63855 is part of the alternate LCD buffer. This is normally used by *TELCOM* to store *F1(Prev)* data, but remains intact during the bank switching procedure.

Both the assembly listing and the *BASIC* program (listing #2) are designed to run in *HIMEM*. If you feel that this code (about 56 bytes) enhances your Tandy 200, you may want to install it in *LOMEM*. I'll cover that topic in a future issue.

A USEFUL APPLICATION

Did you ever want to take a small portion of a large file in one bank, and add it to a file in another bank? This can be quite a project, especially if the file is too large to copy into another bank. To do this, you must first *CUT/COPY* the section of text into the *PASTE BUFFER*. Then you create a new text file, paste the desired text into the new file, and return to the menu. Now, you have to *F4(Copy)* that file (containing the extracted text) into the destination bank, *F1(Bank)* switch into the destination bank, enter the text file, cut/copy it into the paste buffer, go to the Menu, enter the destination *FILE*, and finally paste the wanted

```
1 '*****
2 '*      PROGRAM CHAINING      *
3 '*      by Paul Globman      *
4 '*      Copyright (c) 1988    *
5 '*****
10 FOR I=63900 TO 63955
20 READ X:POKE I,X:SM=SM+X
30 NEXT
40 IF SM=7919 THEN 60
50 PRINT"error in data":STOP
60 SAVEM"CHAIN",63900,63955
70 MENU
1000 DATA 71,62,1,7,5,194,159,249,230
1010 DATA 12,71,14,11,33,221,244,205
1020 DATA 198,249,33,112,248,205,198
1030 DATA 249,80,6,0,33,245,238,243,205
1040 DATA 176,155,251,205,26,28,195,153
1050 DATA 3,197,86,243,205,176,155,251
1060 DATA 193,35,13,194,198,249,201
1070 REM      END OF DATA
```

Listing 2. This *BASIC* program creates *CHAIN.CO*.

```
10 REM PASTE.BA requires CHAIN.CO
20 REM by Will Linden and Paul Globman
30 REM Copyright (C) 1988
40 REM
50 IPL""
60 IFPEEK(63600)<>255THEN170
70 IF PEEK(63560)<>0THEN170
80 POKE63600,0: CLEAR
90 FOR AD=63870 TO 63898
100 READX:POKEAD,X
110 NEXT AD:CALL63870
120 DATA 33,113,248,229,205,104,130,193
130 DATA 197,8,229,193,42,160,242,205
140 DATA 168,130,218,210,50,65,209,205
150 DATA 186,65,195,164,103
160 '----- CUT
170 PA=PEEK(62112)+256*PEEK(62113)
180 IFPEEK(PA)<>26THEN200
190 PRINT"Paste buffer empty":END
200 POKE 63600,255'not empty
210 RESTORE290:FOR AD=63874 TO 63896
220 READX:POKEAD,X
230 NEXT AD
240 CALL 63874,0,PA
250 IPL"PASTE.BA"
260 INPUT "Destination bank";BN
270 IFBN=(INP(216)AND12)/4+1THENMENU
280 LOADM"CHAIN":CALL63900,BN
290 DATA 17,113,248,14,1,126,18,254,26
300 DATA 200,12,202,149,249,35,19,195
310 DATA 135,249,62,26,18,201
320 END
```

Listing 3. This *BASIC* program is used to move to another RAM bank, instead of using the function keys at the main MENU. It will move the contents of the *PASTE* buffer to the destination bank..

text into place. Phew! What a chore!

Now with the use of *CHAIN.CO* and *PASTE.BA*, the above task is accomplished as easily as though both files were in the same bank. First you must get the desired text into the paste buffer. *CHAIN* will pass 256 bytes of data so if the *PASTE BUFFER* contains more than 254 bytes, only

```

org 63870
lxi h,63601 ;xfer buf area
push h ;store it
call 8268h ;eof in hl
pop b
push b
hlmbc ;len in hl
push h
pop b ;len in bc
lhld 62112 ;paste buf adrs
call 82a8h ;call insert
jc 32d2h ;beep menu om?
mov b,c
pop d ;source
call 41bah
jmp 67a4h
    
```

Listing 4. This routine moves data from the transfer buffer to the PASTE buffer.

```

ORG 63874
lxi d 63601 ;dest adrs
mvi c,1 ;counter=1
check: mov a,m ;from source
stax d ;to dest
cpl 26 ;eof?
rz ;yes,done
inr c ;add to counter
jz done ;max chrs=done
inx h ;next adrs
inx d
jmp check ;keep looking
;
done: mvi a,26
stax d
ret
    
```

Listing 5. This routine moves data from the PASTE buffer to the transfer buffer.

if the first 254 will be passed into the PASTE BUFFER of the destination bank (two bytes are used for flags; the first byte indicates if there is data to be transferred, and the last byte is a chr\$(26), or End Of File flag).

So once the PASTE buffer contains the data you want to move, you go to the menu, put the cursor over PASTE.BA (listing #3) and press enter. The program will take you to the MENU of the destination bank. Just enter the file of your choice and press the PASTE key. The extracted text from the first bank is now in the PASTE buffer of the current bank.

The only requirement is that PASTE.BA must be in both the source and destination banks. CHAIN.CO need only be in the source bank.

PASTE.BA originally started out as two programs, CUT.BA and PASTE.BA. They were merged together to simplify some procedures.

The code in listing 3 and 4 are moved into place by poking the bytes read from the DATA statements in the BASIC program (listing 3). Everything runs in the alternate LCD buffer area, so there is no need for the CLEAR statement to reserve memory between HIMEM and MAXRAM.

I would like to extend a note of thanks to Will Linder (Compuserve ID 72737,2510) for beta testing this project and for providing the original CUT and PASTE programs.

by Paul Globman □

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The four best programs for the Model 100 all on one ROM. 32K of power without using any RAM for program storage. This is the PCSG Snap-In ROM that just presses easily into the little ROM socket in the compartment on the back. You access the four right from the main menu like built-ins.

Write ROM — the definitive word processor for the Model 100. Function key formatting or dot commands. Search and replace. Library feature — inserts words, phrases or whole documents into text from just a code. MAP lets you see a picture of your document. In all there are 60 features and functions. No one can claim faster operation. FORM lets you create interactive forms with on-screen prompts that you can answer from the keyboard. Nothing else for the Model 100 compares with the features of Write ROM. Exactly the same as the Write ROM sold as a single program. Infoworld says it "makes the Model 100 a viable writing unit ... sur-

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.

Database: This is a relational data base like no other. You can do everything from mailing lists to invoices. No complicated pseudo-coding, you create input screens as simply as typing into TEXT. You are not limited by size; you can have as large an input screen as you wish. Prints out reports or forms, getting information from as many files as

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

Outliner: Does everything that Think-tank does on a PC but a whole lot better. Includes a Sort for your headlines. Lets you have headlines of up to 240 characters. Has cloning, hoisting and sideways scroll up to 250 characters. Like Lucid, this one sets a new standard for outliners. This is the way to plan and organize your projects.

Present Lucid and Write ROM owners can upgrade for \$150. If you have both it's \$125.

As usual PCSC calls the Super ROM on a thirty day guarantee. If for any reason you are not satisfied, simply return it for a full refund.

We are excited about this product. Super ROM gives the Model 100 the true power of a desktop. No other multi-program ROM has software that compares. But don't take our word for it. We invite you to make that comparison yourself. Priced at \$199.95 on Snap-In ROM.

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