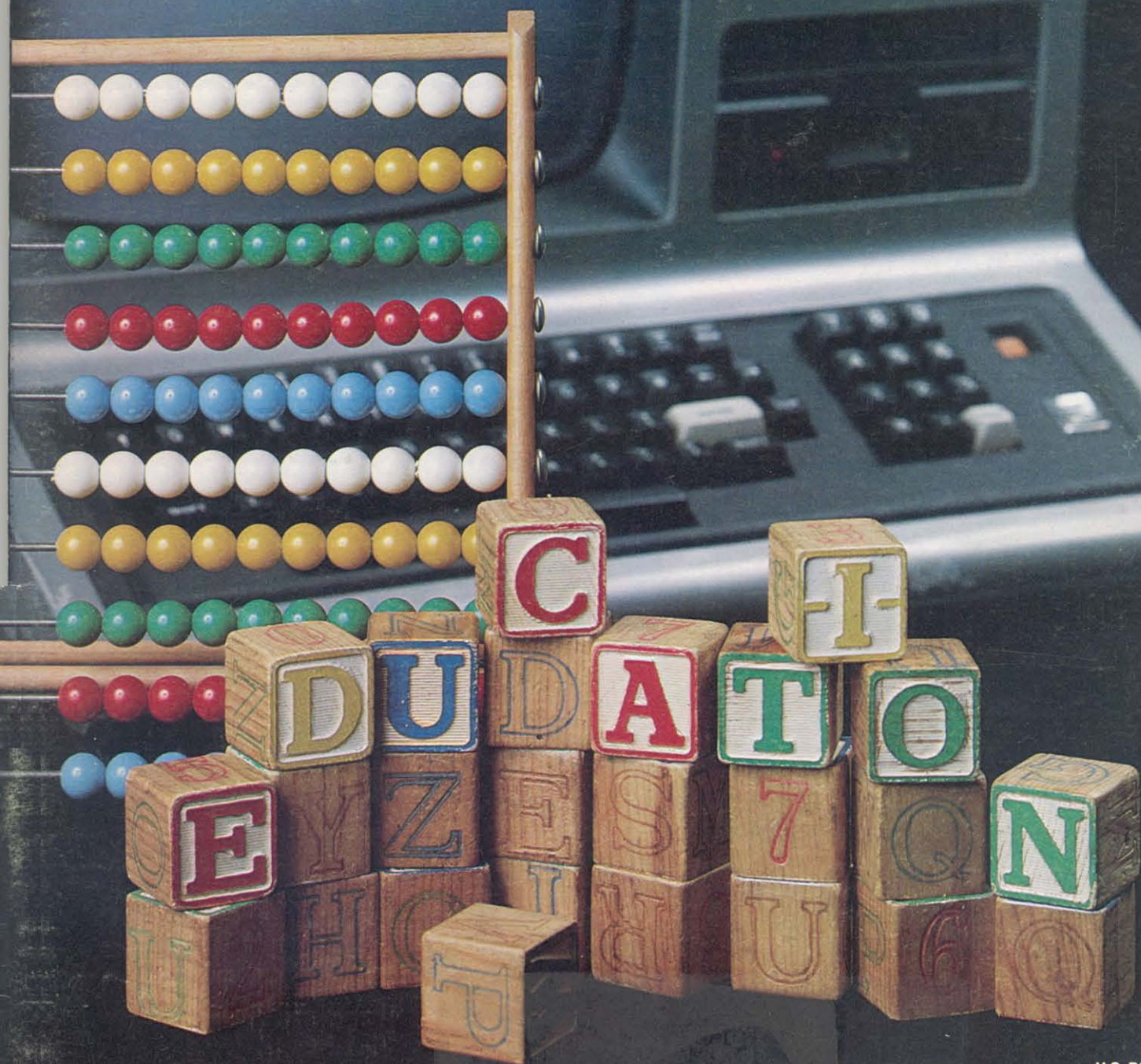


NOVEMBER, 1982
ISSUE NUMBER 51

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THE ORIGINAL MAGAZINE FOR
TRS-80™* OWNERS

H & E COMPUTRONICS INC.



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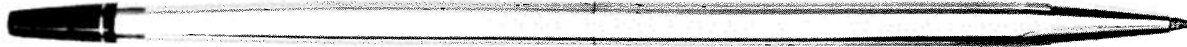
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66 MAXI STAT Is The Most Versatile Statistical Analysis Program Available . . . On Any Micro. 99

Dr. Steven E. Mayer, PhD., Industrial Psychologist — Maxi User



Focus On: Maxi Stat

Who can use Maxi Stat?

Anyone who needs an analysis of statistical data. Maxi Stat has successfully replaced dedicated mainframe and time-sharing statistics programs for business, financial and marketing researchers, educational administrators, hospitals, medical schools and medical research facilities, agricultural testing, and social scientists.

What does it do?

If you're familiar with SPSS (Statistical Package for the Social Sciences) and what it can do on a mainframe, you have a good idea of what Maxi Stat will do for your TRS-80.

Maxi Stat offers many of the best features of SPSS (modified for microcomputers) as well as features you can't get in any other system, at any price. Maxi Stat is one of the most useful analysis packages available — anywhere.

Read on to discover what this remarkable new tool can do for you . . .

Maxi Stat offers:

- menu-driven operation
- user-created codebook
- the ability to handle up to 255 variables
- machine language code allowing speedy data entry
- fast and easy editing
- hundreds of tasks performed at one time
- reports you can custom design for your specific needs
- ample screen prompts to guide user
- frequent automatic backup of data to help protect against power failures and system crashes
- all phases of research analysis, including:
 - write subfiles
 - frequency distribution
 - descriptive statistics
 - crosstabs & chi-square
 - correlation and linear regression
 - t-test
 - multiple linear regression
 - analysis of variance
 - multiple variable response

Summary

See for yourself what hundreds of other professionals have already discovered — Maxi Stat is THE solution to your analysis problems, and it's never further away than your TRS-80. Pull the plug on your time-sharing system and discover the power and convenience of Maxi Stat today!



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By David Walonick

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\$199.95

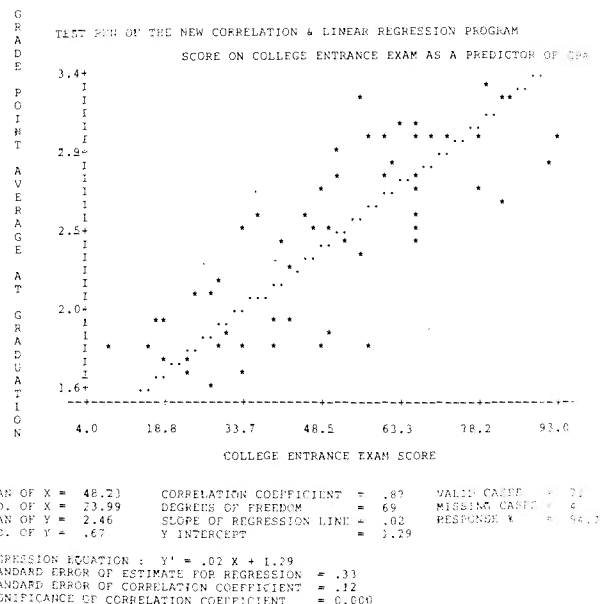
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NOVEMBER 1982

ISSUE NUMBER 51

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BITS AND PIECES

Howard Y. Gosman

ON THE COVER

The computer has replaced the abacus. Unfortunately, too many Radio Shack owners don't know it. Our programmers are constantly speaking to Radio Shack computer owners who know very little about their computer beyond where to find the on/off switch. A little bit of knowledge can go a long way. The TRS-80 by far outperforms the abacus.

Adults seem to have a bigger problem than children in learning how to use a computer. Recently, I brought home a Radio Shack color computer. Within days, my six-year-old was writing simple programs. I started her off with a game called POP-CORN (the best game designed for children as young as 4 years old).

After POP-CORN, we switched to the Model III. A company called PDI has some excellent software for children 4 and up (including adults). Memory Builder is an excellent start

to familiarize your child with the key board. PDI has a variety of other programs to teach your child basic skills. For the adults, PDI has a program called STEP BY STEP (for junior high to adult) which is an excellent step by step workbook approach to learning BASIC on the TRS-80 and interact with your computer (for more information on PDI programs, see our catalog).

COMPUTRONICS CATALOG #10

CATALOG #10 is on the way and should be in your hands by November 1. CATALOG #10 is our largest catalog yet, and the first to include color printing. All current subscribers to the *H & E COMPUTRONICS, Inc. Monthly Newsmagazine* (see your mailing label) will receive a FREE copy of the new catalog. An abridged version of this catalog will also appear in the November issue of *80-MICROCOMPUTING*.

continued on page 6

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The purpose of the *H & E COMPUTRONICS MONTHLY NEWS MAGAZINE* is to provide and exchange information related to the care, use, and application of the TRS-80™ computer systems. H & E COMPUTRONICS, Inc. does not take any financial responsibility for errors in published materials. Users are advised to check and edit vital programs carefully.

The *H & E COMPUTRONICS MONTHLY NEWS MAGAZINE* encourages comments, questions, and suggestions. H & E COMPUTRONICS will pay contributors for articles and programs published in the magazine.

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EIGHTY SYSTEM NEWSLETTER

FOR TRS-80* USERS
(Mod. I/II/III/16/COLOR)

EIGHTY SYSTEM
NEWSLETTER



June 11, 1982

NEW COMPUTER INFORMATION—You may not be aware of the fact that your TRS-80* computer is now being sold in a new configuration. The new configuration is the TRS-80* Model III. The Model III is a new computer that has been designed to be a more powerful computer than the Model II. The Model III has a built-in hard disk drive, a built-in floppy disk drive, and a built-in printer. The Model III also has a built-in modem and a built-in terminal. The Model III is a new computer that is designed to be a more powerful computer than the Model II.

PERSONAL NEWSLETTER—Well, there is a newsletter for everyone. The TRS-80* Model III is a new computer that has been designed to be a more powerful computer than the Model II. The Model III has a built-in hard disk drive, a built-in floppy disk drive, and a built-in printer. The Model III also has a built-in modem and a built-in terminal. The Model III is a new computer that is designed to be a more powerful computer than the Model II.

1000 LIFETIME—The TRS-80* Model III is a new computer that has been designed to be a more powerful computer than the Model II. The Model III has a built-in hard disk drive, a built-in floppy disk drive, and a built-in printer. The Model III also has a built-in modem and a built-in terminal. The Model III is a new computer that is designed to be a more powerful computer than the Model II.

WARRANTY—The TRS-80* Model III is a new computer that has been designed to be a more powerful computer than the Model II. The Model III has a built-in hard disk drive, a built-in floppy disk drive, and a built-in printer. The Model III also has a built-in modem and a built-in terminal. The Model III is a new computer that is designed to be a more powerful computer than the Model II.

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THE CRYSTAL BALL

(News and Rumors of Interest to TRS-80 Owners)

COLOR COMPUTER NOTES

RADIO SHACK is now selling a new version of the COLOR COMPUTER, but no one really knows about it, and Radio Shack is not really anxious for owners of the older version to know about the new version. Why is this? If you have purchased a COLOR COMPUTER recently, you'll find that it contains a modification that allows the addition of memory to a maximum total of 64K. If you have an older COLOR COMPUTER, the maximum memory size is only 32K, and you cannot get your computer upgraded! Which one do you have? Apparently, Radio Shack intends to upgrade the new COLOR COMPUTER even further. We expect to see Radio Shack release a new disk operating system that may add several features essential for a serious business-oriented system, including Random Access file capability and perhaps even support of a rumored COLOR COMPUTER Hard Disk Drive. With a new operating system and 64K of memory, the COLOR COMPUTER may even rival the Model III!

Radio Shack's software for the COLOR COMPUTER is also being improved. COLOR BASIC 1.1 has now been released, and it has some excellent new features for owners of this machine. You can now produce graphics on a line printer, without any additional software. If you have a line printer that has a 7- or 8- bit option (such as the Radio Shack Line Printer VII), all you have to do is set the 7/8 bit switch to 8 bit. If you use a joystick, the TV will no longer display a string of characters when you press the "Fire-When-Ready" button—but if you use Radio Shack's CHESS or CHECKERS programs, you will now have to press the SPACE BAR when the program prompts you to press the "Fire-When-Ready" button, and if you use their BUSTOUT program, you press the space bar to get the next ball. Under COLOR BASIC 1.0, the screen didn't display an S (for Search) or F (for Found) when the computer encountered an "ungapped" file on cassette—now it

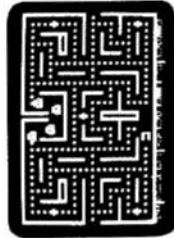
does. Finally, you can now have full 255-byte records in your data files without the risk of losing information.

Where can you get a COLOR COMPUTER Assembler/Disassembler for only \$3? The September 1982 issue of 80 U.S. contains an Assembler and a Disassembler, both written in Extended BASIC, along with complete and clear operating instructions.

SERVICE CONTRACTS

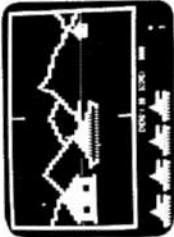
The cost of servicing your computer, as many of you well know, usually ranges from exorbitant to astronomical. In businesses especially, the customary way to avoid crippling repair costs is to get a form of "repair insurance": the service contract. The service contract states that, for a single set fee and a set period of time, the servicing company will do any repairs necessary on the covered equipment, for no additional cost. However, rather than concentrating on protecting the users of microcomputers, many service companies have been more concerned with protecting themselves. Instead of paying an astronomical repair bill, you pay a service contract fee that is frequently more astronomical than any conceivable repairs could be. In the past, if you've shelled out for complete coverage of your computer, you probably have been tempted to hope that something major *does* go wrong with your machine, just so that you have a chance of getting your money's worth of repairs! And if your contract calls for on-site service (the repairman comes to your location), then the costs can be even higher. This is quite a dilemma, especially for the business user who can't afford to have a computer out of service even for a few days. Most businesses have got to have a repairman who can come to fix a problem *immediately*. If you do have a service contract, and then don't need any repairs, then you've just paid out a large sum for nothing (except "security"). If you don't have a service contract, then you will not only pay great sums of money for repairs, you'll also pay a

continued on page 6



SCARFMAN

This incredibly popular game craze now runs on your TRS-80! It's eat or be eaten. You run Scarfman around the maze, gobbling up everything in your path. Try to eat it all before the time runs out. You can't defeat the monster machine. Challenge your skills with this addictive action game from the Corsett Group. With sound. Price: A.



ARMORED PATROL

A realistic tank battle simulation. Your view is a 3-D perspective of an alien landscape. Maneuver your 1-36 tank to locate the enemy. Destroy any tank you find. That's the beauty of Armored Patrol. You can't be killed. You can't be defeated. You can't lose. You can only win. Challenge your skills with this addictive action game from the Corsett Group. With sound. Price: B.



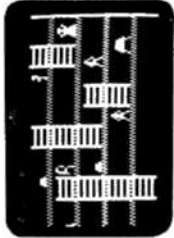
REAR GUARD

Deadly waves of enemy Cyborg craft attack your feet from the rear. You are the Mothership's sole defender. You have unlimited firepower. Destroy any Cyborg craft that dares attack you. Your abilities are tested hard in this game or lightening fast action and lively sound from Adventure International. Price: B.



STRIKE FORCE

As the primary defender of a world of cities under deadly alien attack, your weaponry is the laser, rapid and incendiary "star shells." Your force field can absorb only a limited number of impacts. A complex game of strategy, skill and reflexes from Melbourne House. Price: A.



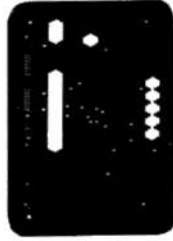
PANIK

Trapped at an enemy building site, your fate seems certain. Your laser is your only and evasive escape. Destroy the enemy's weapons and escape the one step ahead of the various monsters. A challenging game for agile minds. From Fantastic Software. Screens of horizontally scrolling sea-scape and sound from Adventure International. Price: B.



SEA DRAGON

Your submarine, the U.S.S. Sea Dragon, penetrates a mined enemy channel. Armed with missiles and torpedoes, you must navigate the minefield and evade the enemy's torpedoes. A challenging game for agile minds. From Adventure International. Price: B.



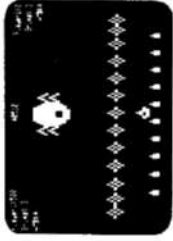
BOUNCEOIDS

Huge boulders career off the walls. You're in the middle, in danger of being flattened. Keep your wits about you as you blast these "bounceoids" from the screen. Large ones break into many small ones. Clear a screen, and win a fast-paced and challenging game with a fast-paced and lively sound. From the Corsett Group. Price: A.



CATERPILLAR

An arcade favorite! Stop these multi-sectioned crawlers before they creep down through the mushrooms. Zap one and it splits into two smaller bugs. Each with its own sense of direction. There are moths and tumble bugs too. It all adds up to lots of fun for kids and adults alike. From Soft Sector Marketing. With sound. Price code: A.



DEFENSE COMMAND

The invaders are back! Alone, you don't stand a chance. Join the brave defenders from the repeated attacks of the alien invaders. Repel them. An alien passes your guard. Snatches a canister and flies straight off. Quick! You have one last chance to blast him from the sky! With sound and voice. Price: A.



CRAZY PAINTER

You have to paint the floor white. We give you the paint and brush. Sounds easy? You must be confounded by the fast-paced and lively sound of Crazy Painter. Even a "crazy" paint eater. A crazy, imaginative, new game with ten selectable levels of skill for new or seasoned game players. Lot's of laughs. Price: A.



SUPER NOVA

Asteroids float ominously around the screen. You must destroy the asteroids before they destroy you. (Big asteroids break into little ones). Your ship will respond to thrust, rotate, hyperspace and fire. Watch out for the hyperspace and fire. Watch out for the hyperspace and fire. Watch out for the hyperspace and fire. Price: A.



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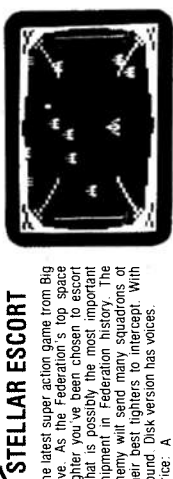
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Price includes Joystick + Alpha interface + Instructions + Demo Program listing. Please specify Model I or II.
14 DAY MONEY BACK GUARANTEE

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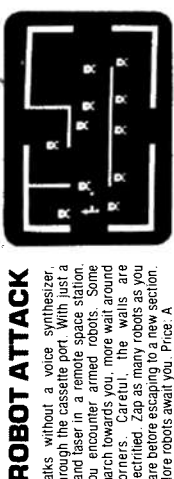
- TOP TEN**
1. SCARFMAN. All time favorite
 2. ARMORED PATROL. Super 3D graphics
 3. PENETRATOR. Rare reviews
 4. STELLAR ESCORT. Fast and Challenging
 5. CRAZY PAINTER. Unique game concept
 6. PANIK. Remarkable Voices
 7. DEFENSE COMMAND. Tough struggle
 8. CATERPILLAR. Good rendition
 9. ROBOT ATTACK. With voice
 10. SEA DRAGON. Amazing "Seascope"

SAVE 10, 15, 20%



STELLAR ESCORT

The latest super action game from Big Five. As the Federation's top space fighter you've been chosen to escort what is possibly the most important shipment in Federation history. The enemy will send many squadrons of the fastest fighters to intercept. With sound. Disk version has voice. Price: A.



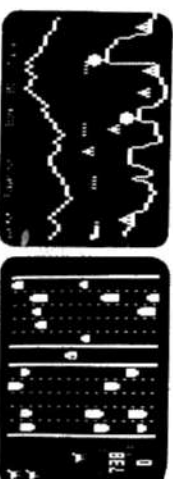
ROBOT ATTACK

Talks without a voice synthesizer through the cassette port. With just a hand laser in a remote space station you encounter armed robots. Some march towards you, more wait around corners. Careful, the walls are electrified. Zap as many robots as you dare before escaping to a new section. More robots await you. Price: A.



LUNAR LANDER

As a vast panoramic, moonscape scrolls by select one of many landing sights. The more perilous the spot the more points scored -- if you land safely. You control LEM main engines and side thrusters. One of the best uses of TRS-80 graphics we have ever seen. From Adventure International. With sound. Price: A.



CHICKEN

Will the chicken cross the road? That's up to you. Can you guide these helpless little chicks across the perilous 10 lane super highway to safety? Or will you tumble into the abyss? You control the chicken's path. Features sound, trainer mode and customizing program. Price: C.



GALAXY INVASION

The sound of the klaxon is calling you! Invaders have been spotted warping toward Earth. You shift right and left as you fire your lasers. A few break above the globe, you intercept Soviet formation and fly straight at you! You place your finger on the fire button knowing that this shot must connect! With sound effects! Price: A.



OUTHOUSE

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THE CRYSTAL BALL

continued from page 4
ridiculous hourly rate for the repairman to drive to your location. For example, Radio Shack's present policy for on-site, non-service contract repairs is typical. In addition to parts and labor for the repair itself, you will pay \$52 per hour for driving time (with a 2 hour minimum charge) plus tolls and mileage. With charges like this, you'd better pray the repairman doesn't get caught in a traffic jam! On the other hand, a Radio Shack service contract for a single Model II computer will cost in excess of \$1300 per year! That's a lot of money if the only repair you need is to have the disk drives realigned once or twice.

So what's the answer for a computer owner? Well, at the present time we would suggest the following: if there is any way at all that you can do without your computer for a while, either by borrowing or buying another computer as a "hardware" backup, then don't get a service contract. But, if you are in a business, like most businesses, that needs to have a reliable computer every day, then

you have no real choice—you have to have a service contract. Your business could depend on it.

Well, we've stated the problem pretty completely. Most experienced users are well acquainted with this dilemma. And here's some good news: service companies are starting to notice that the complaints of users are getting louder and louder. When a company has to charge so much for insurance that their machine keeps running, it does not inspire the greatest confidence in prospective users. If they charge so much, then the machine is bound to break down a lot, right? In order to stay competitive in the present market, companies are making greater and greater concessions to the needs and desires of users. As an example: two and a half years ago, I asked a rather high-ranking Radio Shack computer person (the manager of one of Radio Shack's first computer centers—the most knowledgeable member of that company that I've ever spoken to) whether Radio Shack would ever consider leasing equipment to businesses. The answer was:

"Never! Not in a million years!" Well, Radio Shack *does* have a leasing program now, only two years later. They do not turn a deaf ear to the requests and suggestions of users. On the contrary, they have, more than any other company, shown a steadily increasing tendency to accommodate their customers. As an example: in our own business, we absolutely depend on seven TRS-80 computers. To be without a service contract for each computer would be *unthinkable*. Our local Radio Shack repair people know how essential our computers are to our business, and when we place a service call they invariably rush over to our office as fast as possible, usually the same day. Not only are they fast, they're also very competent. For us a service contract is well worth the cost.

At last, here's a prediction: in the very near future, we will see a dramatic reduction in the cost of service contracts, which will eventually result in an industry-wide movement toward more reasonable pricing for service. This will be partly due to large companies which are slowly becoming more sensitive to users' needs, and to third-party service organizations that do *nothing but* service other companies' equipment, providing competitive pressure on manufacturers to provide service at reasonable rates (we will even see a growing number of *independent* servicemen who run their own repair shop in much the same manner as radio and TV repair shops operate today. All of these developments will result in a lot of happy users, and even more business for computer manufacturers. It's in everybody's best interests.

BITS AND PIECES

continued from page 2

SELL YOUR TRS-80 AND BUY AN APPLE?

Why did you buy a TRS-80 instead of an APPLE? If you did, you made the right decision. Our staff of in-house programmers are becoming increasingly negative about the APPLE. Our programmers who learned programming on a TRS-80 and later had to learn how to program the APPLE,

continued on page 8



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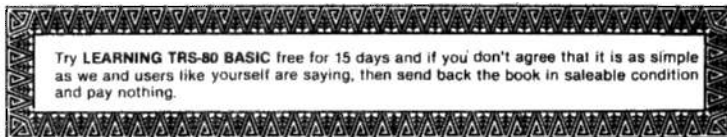
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BITS AND PIECES

continued from page 6

hate it. They content that the APPLE version of BASIC is primitive and difficult both to learn and to use. Even worse, our programmers who first learned about computers by using the APPLE now want to do all of their programming on the TRS-80 (and the Model III is now everyone's favorite machine).

So how come the APPLE II is the world's largest selling computer? The answer is easy. Go into a Radio Shack store and ask the question, "Why should I buy your TRS-80 instead of the APPLE?" The usual answer is that "the TRS-80 is a very good computer." Now, try going into a non-Radio Shack Computer store and ask the opposite question: "why should I buy an APPLE instead of a TRS-80?" The usual answer is: "The APPLE and the TRS-80 are about the same price. The APPLE does everything that the TRS-80 does, but in color. Why do your check register and use VISICALC in black and white when you can do the same thing in color on the APPLE?"

Well, I just wanted all TRS-80 owners out there to know that you *did* make the right decision. The TRS-80 is better than the APPLE. APPLE BASIC is very primitive compared to the advanced BASIC used on the TRS-80 computers. In addition, you have a 64 (or 80) column screen on the TRS-80. The APPLE comes with a 40 column screen that is terrible for word processing and makes business programming nearly impossible. The TRS-80 comes with just about everything you really need in a computer. If you purchased an APPLE, you would have to purchase and install separate boards in order to use a parallel or serial printer. The problem becomes even worse when you try to actually make your APPLE print. Some people will tell you how great the APPLE graphics are for playing games, but most owners want to do a lot more than play games with their computer. My reply is, you definitely made the right decision in buying a TRS-80. You even saved about \$400 (the difference in price for a comparable APPLE). If you want to play games, you can use the \$400 you saved to purchase an ATARI or COLECO video game!

THE NEW RADIO SHACK CATALOG

The NEW Radio Shack computer catalog (RSC-8) is *stunning*. Radio Shack is finally coming of age. Let's just run through some of the highlights:

1. It's hard to believe, but Radio Shack is now selling LDOS. This is a good move on their part. LDOS is non-Radio Shack software (also sold through the COMPUTRONICS catalog). LDOS is an excellent alternative to TRSDOS, with many added features, including support of hard disk drives.

2. The K-8 Math Series is an excellent series of programs for computer-assisted education that should be in every house that has a TRS-80 and a child in grade school.

3. SUPERSCRIPSIT for the Model I and Model III adds all the major features that the original Model I/III SCRIPSIT lacked. Now the Model I/III version is nearly as good as the Model II version (although we at COMPUTRONICS still prefer the ELECTRIC PENCIL).

4. Radio Shack has introduced a 5-megabyte hard disk drive for the Model I or III. The price is \$2500, or about \$500 per megabyte. The cost to add another drive is \$1995 making a total cost of about \$4300 for 10 megabytes. However, non-Radio Shack hard disk drives tend to sell for about \$2995 (for 12 megabytes), so the Radio Shack drives are presently priced a bit too high.

5. A \$995 portable data terminal allows users to access the TRS-80 over the telephone.

6. Radio Shack now has a very popular item that has been asked for by many COMPUTRONICS readers: a printer switch that allows the user to connect two printers to one computer or two computers to one printer.

7. Radio Shack's biggest dud seems to be their new low-cost daisy wheel printer. It sells for \$1495. My recommendation: stay away from it and buy the excellent quality \$1995 version. The less expensive version is too slow and lacks many of the best features of the more expensive printer.

8. Radio Shack's other new printers are great! As stated above, their hard disk drives are very overpriced compared to the competition, but Radio Shack's new printers priced just right to provide strong competition for

continued on page 15

PROGRAM PREVIEWS

A. A. Wicks

This Month: VersaLedger II

A series of advertisements by H & E Computronics for a new "VERSA" series of business programs piqued my interest because business-oriented programs are the mainstay of this monthly review. I made a request to review VERSALEDGER II, partly because it seemed like a less complex program to start off the series, and partly because no business can be without a check accounting record of some kind, though they may never need complex payroll or inventory-type records. Then too, a good check record may also be used to advantage by an individual in this check-writing society that we live in.

VERSALEDGER II, written by Richard Kaplan, appears to be targeted for the users that I like to see benefit from small computer applications—businesses of from one to 200 employees, for instance, and grossing from a few hundred dollars to a few hundred thousand dollars per year. To place this in perspective with VERSALEDGER II, the program will support the records of up to 3000 checks and/or journal entries per month and 1000 general ledger accounts, depending upon equipment configuration. It will do much more along the way, of course, which will be described—so let's go through its operation in more detail.

VERSALEDGER I VS. VERSALEDGER II

VERSALEDGER II is an upgraded version of the original VERSALEDGER program, which has been available for a year now. In addition to VERSALEDGER's check register capabilities, VERSALEDGER II includes a general ledger, which can produce a myriad of reports (customized balance sheets & income statements, trial balances, account listings, and many more). The most outstanding feature of VERSALEDGER II, however, is that this program may be used as a stand-alone check register, as a stand-alone general ledger, or as a linked check register/general ledger. Any or all of

VERSALEDGER II's features may be independently activated at any time.

WHO CAN USE VERSALEDGER II?

VERSALEDGER II will operate with all TRS-80 computers, the Apple II, Atari 800, Xerox 820, and IBM PC. It should also be noted that VERSALEDGER II will operate on "virtually" every CP/M-based computer that can read 8" single density disks. This is quoted from the manual, and is qualified with a small restriction due to the slight variations that may appear between CP/M systems. A configuration program is provided for CP/M users in order to customize VERSALEDGER II for most CP/M machines.

Because of the large number of different computers that may use VERSALEDGER II, considerable material has been presented in the manual that accompanies the program, in detailing the preparation of backup copies of VERSALEDGER II, and program initiation. These instructions are explicit, and the user should have no difficulty in this respect, or in subsequently running the program.

A big boost in this regard for Model I/III users is that the program comes on a disk with a Disk Operating System already on it—the eminent DOSPLUS, which also provides such comforts as lower case operation for Model I users, repeating keys, and full cursor control. I notice that more and more producers of programs are beginning to do this, and must agree that it is a great boon—especially for users with only one disk drive. This service of DOSPLUS operation is not extended to Model II users, however, who must place TRSDOS onto their VERSALEDGER II program disk. This should not be a problem with the instructions provided.

VERSALEDGER II is truly a "turn-key" software package. Initiating computer operation (boot-up) loads the program and displays the main menu. VERSALEDGER II is completely menu-driven—that is, all operations



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are performed by the computer as a result of menu selection and screen dialog. A very nice touch is that VERSALEDGER II is supplied with a complete set of sample data files—anyone can load VERSALEDGER II and start experimenting within an hour—a set of check register entries and a general ledger chart of accounts has already been set up.

**THE MENUS —
QUITE UNUSUAL**

The various functions of the system are divided into four major menus (additional subsidiary menus appear during the execution of certain functions). The MAIN MENU is concerned with the maintenance of check register files, the GENERAL LEDGER SUB-MENU controls the functions of the general ledger, the FINANCIAL STATEMENT & CHECK REGISTER POSTING MENU allows you to print user-defined reports and to integrate the check register with the general ledger, and the SYSTEM MENU provides you with utility functions for starting new files, and defining report formats.

The menu routines are unusual. A movable pointer is used to indicate which option is being selected (on the Model I, an arrow is used; on the Model III a hand is shown pointing a finger at your selection; on the Model II, the option being selected is displayed in reverse video). Whenever the program returns to the menu, the pointer will indicate which option was last selected. The pointer is moved up and down using the arrow keys.

USING THE CHECK REGISTER

There are two major components of VERSALEDGER II: the CHECK REGISTER and the GENERAL LEDGER. Either component may be used individually, or the two functions may be linked. I will first discuss the CHECK REGISTER functions.

VERSALEDGER II is supplied with a pre-established check register chart of accounts. The user may choose to create his own unique chart of accounts, or he may wish to simply modify the pre-established chart of accounts for his own needs. A large

business may have a great many different accounts that they may wish to maintain on their ledgers. An individual or small business operation may have only a few. With VERSALEDGER II, the choice is up to the user.

Every entry to VERSALEDGER II may be posted to any account(s) in the check register chart of accounts. For example, in a payroll check \$200 might be posted to account 201 (SALARIES), -\$20 might be posted to account 202 (FEDERAL TAX), and -\$3 might be posted to account 203 (STATE TAX). When a check register printout (REVIEW CHECKBOOK) is performed, each entry which comprises this check will be printed, along with the total (\$177). A listing may later be obtained of each account and its associated transactions over any given period of time. This is extremely useful at the end of a year for tax purposes.

Menu selection of the "Add to Checkbook" option permits entry of check information. As data is entered and completed <ENTER> increments the check number by one. Entry error correction is possible. It is also possible to skip check numbers, returning at a later time to enter these if desired. Deposits and bank adjustments (by typing D and B respectively), are labeled as entered. Of course, you have the option of having these in their own Account categories, too. Also, two deposits or adjustments may be entered with the same label — they will automatically be totalled when "Review Checkbook" is performed. Thus, one may be a negative amount to cancel the previous, but both may be observed for review. Very useful for breaking one deposit into cash, checks, or credit cards, for instance. Or, perhaps to reverse-out a previous bank adjustment, or reversing a check issued and then having payment stopped.

If you wish to print a check, the format is for a New England Business Systems (NEBS) check # 9020.

Locating a check register entry to be viewed, edited, or deleted can be done in two ways. The larger the check register, the longer it will take, ordinarily. But, with VERSALEDGER II, if you know the Item Number (a number which is appended automatically at entry time), then you may go

almost immediately to the entry to be retrieved. Check number 106 may be recalled as T106 (transaction 106) or 15 (the fifth item in the check register). As you may surmise, the first method will take as long to search as the position down the list of the transaction entails, which may be a short time, but it may also be long. You may use either method.

A complete review of the checkbook ledger may be obtained by menu selection. The resulting immediate listing will show the current account, month and year, and will include all checks, deposits and bank adjustments. You have the choice of sending this listing to the printer as well as the screen. Ten items at a time are displayed, and pressing <ENTER> causes the next "page" to appear. Completion of the listing will show initial balance, final balance, and outstanding check balance. The account file and month/year is also shown, of course.

The procedure "Account Development and Edit", which is used to maintain a check register chart of accounts, is rather extensive but far from complex in the performance of the function. Similar options are available for setting up a general ledger chart of accounts.

Some comment is in order regarding the SORT FILE option. (This function will sort a check register file or a group of general ledger journal entries by check number, by account number, or alphabetically according to the PAYABLE TO/DESCRIPTION or COMMENT fields.) The sort by check number option is very useful if a check is entered out of order, i.e., a handwritten check. When this is requested, the routine is loaded from disk, and a status display is provided giving a progress report on the sort. (Another useful feature is that the SORT FILE option is directly available as an option on three of the four main menus.)

USING THE GENERAL LEDGER

Users who have advanced accounting needs may activate the GENERAL LEDGER SUBMENU of VERSALEDGER II. This portion of VERSALEDGER II may be completely ignored by a user operating only a check register;

yet, the same user may easily expand at any time to full general ledger capability.

VERSALEDGER II maintains a general ledger chart of accounts, which is independent from the check register chart of accounts. Information stored includes an account number, an account title, type of account (balance sheet/income/expense), a current balance, and a year-to-date balance. Of course, accounts may be added, deleted, viewed, and edited at any time with ease.

Journal entries may be posted to VERSALEDGER II in two ways. One option from the menu permits the user to enter each portion of an entry as a separate journal entry. (The user must be sure the transaction balances to zero.) Another option forces the user to enter balanced journal entries. Each portion of a journal entry is assigned the same journal entry number, and they are grouped together on the transaction register.

An advantage VERSALEDGER II has over virtually every other general ledger presently available is that account balances are immediately updated when a journal entry is made. The end of month procedure need not be run in order to update balances, as is the case with most accounting systems.

FORMATTING THE FINANCIAL REPORTS

VERSALEDGER II prints a multitude of reports (17 in all), including 4 types of trial balances (detailed or summary, monthly or YTD), a transaction register (a listing of all transactions entered in a given month), summary or detailed account listings, and user-definable income statements and balance sheets.

Most commercial general ledger packages available restrict the user considerably in formatting income statements and balance sheets. This is not so with VERSALEDGER II. The options available to the VERSALEDGER II user in generating income statements and balance sheets make this program perhaps the most versatile general ledger package available today—VERSALEDGER II enables the user to format these financial reports in virtually any way desired—almost

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BEGINNER'S CORNER

Spencer Koenig

This Month: The Beginner's Library (Which Books to Buy)

Hello again. It's time once more for inside information on where insiders get their information. Besides reading all of the latest periodicals around, either at the library (there are several hundred professional and semi-professional journals available) or by subscription (like the little gem in your hands), there are dozens of books that belong on your shelf, regardless of what your level is.

When I began my journey into the world of microcomputers, there was much less of a variety from which to choose. There was also much less information accessible written for the neophyte's point of view and experience. Today the problem isn't any easier. There are so many books for every level of programmer that it's too easy to make the wrong decision about which book to buy. Your alternative at this point is to read every review you can get your hands on — or maybe I can help.

In this article, I'm going to give you a list of books that should be on your shelf. If they're not, then plan to get them or leave subtle hints around on what you would like for the coming holidays.

Some of the books are as important today as when I first came upon them (in some cases more important), and some are very new books that should take the place of those less useful. The trouble with reviews is that they usually examine only one book at a time. This review article will examine quite a few, although not in as much depth.

In example 1, I have listed several books which are not only good reference materials but well written for readers at any level. The Osborne books are not really at the same level. Volume zero has been re-done and is a little friendlier than the usual style of most of the other Osborne books I've come across. Volume zero might also be less useful than volume 1 for many of you, especially if you have a text that deals with the same topics.

Those topics covered in Volume zero are: A brief overview of computers today; the parts of the computer that make the whole; choosing a computer; what software is and how to run it; computer languages; introduction to computer math; what happens inside the computer; and a section called "putting it all together", which deals with some terminology and concepts that at times get very technical. It's an inclusive summary of what goes on in the computer in much greater detail.

All in all, Volume zero doesn't talk down to you, but it is very thorough and expects you to be able to think a little on your own. It is arranged like the other books in the series, with more general concepts in bold type and more specific information (often more technical) set in regular type. The advantage of this format is that you can read (and understand) what you like, and you can go back for more as you understand more. The book costs \$7.95, and its value is \$8.00

I'm sorry, I didn't explain my rating system that I'll be using from now on. It's really very simple. A while back, some friends and I were discussing the latest movies that were around and giving them informal reviews. One of my objections to the way a movie was rated was that you couldn't tell if a film was worth the trouble of going to a particular theatre and spending a certain amount, or waiting for it to come to the local bargain theatre.

Out of that discussion I came up with this scheme: I started rating a film by the dollar value I thought it was worth. For example, the block buster "STAR WARS," came to the movies costing about \$5.00, and I gave it a value of \$5.00, which meant that it was worth spending the full cost. If you paid less, however, then you got a real bargain.

Another example would be "HUMANOIDS FROM THE DEEP." This flick came to my neighborhood costing \$4.00, and I gave it a value of 75 cents. I know what you're thinking: "He had the nerve to go see that movie!"

I can explain. I happened to be in the mood for some really bad movies (a rare event, but true). You get that way when you've spent a lot of time seeing intellectual foreign (often depressing) German or French films (excuse me). Well, that day I decided to go escapist, and there wasn't much around which I either hadn't seen or was interested in. So I went to a double feature of "MAD MAX" and "HUMANOIDS FROM THE DEEP." To make matters more interesting, I went to the Matinee when all the kids were there being noisy and commenting on the film while it was going on, and usually adding better dialogue than that of the actors. To make a long story short, I had a great time.

I saw in one sitting what are probably the two worst movies of the last 10 years. Unfortunately, I can't go into detail here about why it was so much fun, but if you're interested, drop me a line and I'll be glad to answer you personally (send a SASE — I could get a mountain of requests).

If by chance "HUMANOIDS" should come to a \$1.50 theatre as a double feature, and you're in the mood for movie-trash, then by all means have a good time. I believe it's destined to become a classic, with others like "ATTACK OF THE KILLER TOMATOES."

Well, now that you understand my rating system, you should know that most of the books in my list are worth more than the actual value at which they're sold. Volume 1 of the Osborne series is a prime example. This book is worth at least twice the value. I say this because I've seen books that cost twice as much but contain half as much information. In short, volume 1 is a real bargain.

Volume 1 deals with some of the specific timing specifications, as well as an introduction into programming in assembler for micros. It also covers some of the same

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PROGRAM PREVIEWS

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like VISICALC.

With VERSALEDGER II, headings on these financial reports are completely user-defined and may be printed at any position on a page. Sub-totals and totals are again user-defined — any consecutive group of accounts may be totaled and printed at any position of a report.

THE LINKED CHECK REGISTER/GENERAL LEDGER

When both the check register and general ledger features of VERSALEDGER II are utilized, VERSALEDGER II can automatically link the two features. Summaries of each check register account may be posted to the general ledger at the end of a month. In this manner, a detailed record of a month's activity is available within the check register for audit trail purposes, and a summary is available within the general ledger.

THE VERSALEDGER II MANUAL

The VERSALEDGER II manual, which is more than 150 pages long, is comprised of seven major sections:

"An Overview of VERSALEDGER II" explains the use of the system's menus, and describes the interactions between all of VERSALEDGER II's functions.

"Learning VERSALEDGER II" will guide even the totally uninitiated computer-user through the process of making safe disk backups, entering the VERSALEDGER II program, viewing, printing, and manipulating data from the sample data files, and finally, initializing real data files, starting to enter real data, and using the system on a day-to-day basis.

"The Main Menu" describes the operation of all functions related to maintaining the check register and the check register chart of accounts.

"The General Ledger Submenu" describes every operation of the general ledger portion of the program.

"The Financial Statement & Check Register Posting Menu" explains how to generate the user-defined balance sheets and income statements, and how to post the check register to the general ledger files.

"The System Menu" describes the

operation of utility functions such as initializing the system, starting a checkbook, general ledger account file, transaction files, and the special user-defined format files that are used by the system when generating balance sheets and income statements.

Finally, a lengthy Appendix contains such valuable auxiliary information as: technical information about VERSALEDGER II's disk files, how to make backups and format disks using DOSPLUS, how to get preprinted NEBS checks, an explanation of error messages, what to do if you have a problem, a summary of differences between VERSALEDGER I and VERSALEDGER II, and, most importantly, *51 consecutive pages of sample printouts generated from the sample data files.*

The options in the four menus are described in a format that provides the user with both an in-depth description of the option, and with a quick reference guide to the screen displays and operator responses for that option. The manual's description of each menu option is divided into three parts:

(1) A brief summary of the option, which includes the option's location (which menu it is found in), a brief statement of its function, and a one-paragraph description of its purpose.

(2) A depiction of every screen prompt and message included in that function, and examples of all possible operator responses.

(3) A section providing 'additional information', which consists of an in-depth description of all uses of the option, how the option relates to the rest of the program. There are also technical explanations for programmers, tips to make the program run faster, etc.

An extensive set of sample printouts is provided in the manual. These printouts trace the activity of a fictitious company over a 2-month period (using the same sample data which is provided to the user on disk). Any questions a user might still have after reading the manual would undoubtedly be cleared by examining these printouts.

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SUPER UTILITY PLUS S/E SPECIAL EDITION

This Special Limited Edition Package will be in high demand as only 500 copies will be made. They will be numbered 1-500 and will be personally signed by the author, Kim Watt. YOUR name will be embedded in the program as the serial number. The following is included with this SPECIAL LIMITED PACKAGE:

- 1) SUPER UTILITY PLUS S/E in /CMD File Format. Both MOD I and III versions are included, and your NAME will be the serial number. This will NOT be a protected disk, and you may make as many BACKUPS as you wish. The serial number is NOT changeable.
- 2) TWO attractive SU+/SE binders.
Binder #1 will include:
Three manuals in LARGE format (8 1/2 x 11")
(a) SUPER UTILITY+ Manual
(b) INSIDER SUPER UTILITY by Paul Wiener/
foreword by Kim Watt
(c) SUPER UTILITY TECH Manual by Kim Watt & Pete Carr
Binder #2 will include THE SOURCE CODE for SUPER UTILITY PLUS.
Yes...the SOURCE CODE to this MAJOR program will be available to 500 programmers. This is FULLY commented by the author, Kim Watt, and is a machine language programmer's dream come true! After reading this, your machine language programming skill should increase tremendously. All of Kim's knowledge in ONE book! All at your disposal and for YOUR use.*
- 4) The license to USE Kim Watt's sub-routines... will be granted to those 500 registered owners! These 500 ONLY will be able to apply all of Kim's magic to THEIR programs. No royalty fee necessary. In other words, IMPROVE YOUR PROGRAMS! Take Kim's ideas and expand on them! Never has anything EVER been done like this before. These 500 ONLY have the right to use our sub-routines. This information is NOT being put in the public domain. We are allowing these 500 to use our routines by buying our special package. All copyrights and trademarks are retained by Breeze/QSD, Inc.
- 5) SU+/SE is NOT available from any dealer, but only directly through Breeze/QSD, Inc. Customers will be handled on a one-on-one basis. Confirmed orders will be pre-registered and a matching card must be returned by purchaser for full support from Breeze/QSD, Inc. We will know who each and every owner is, so full support can be given. We DO want you to sign and return our registration card for this support to commence, however. No exceptions will be made.
- 6) This is a very important step that we are taking, and only a select group can appreciate the value in a package like this. This is NOT for the general mass market. It is a college education in machine language written by a recognized expert. It IS SU+ in /CMD file form. It is a license to use Kim Watt's sub-routines. It is an opportunity to vastly improve your product. It is a collector's item, also. Limited. Indeed. Last, but not least, it is expensive. On the surface only, however, as this product will make you an expert programmer if that is what you want. You can literally write a DOS from studying the code! It will also make you a member of an elite group that has access to Kim's knowledge and can USE that knowledge to YOUR benefit.

Source Code is FULLY Commented.

**Price for the Super Utility Plus-
Special Edition is
\$500**

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*Credit to Kim Watt and Breeze/QSD must be given in the program and in the documentation for sub-routines used. There is NO royalty fee to pay however.

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BEGINNER'S CORNER

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information in volume zero, but again in more detail. You begin to understand just how a computer interprets your instructions and how the clock of the CPU keeps things clear so the machine doesn't crash, etc. Concepts such I/O, the stack, computer math, ASCII, indexed addressing and so on are all explained in some detail. As in volume zero, the text is arranged in two kinds of type, so you can read what you understand and go deeper into the subject later on.

The Glossary from Running Press should definitely be in your hands when you begin getting into CPU's. I've bought this little jewel for a number of friends and associates when they were reading about something new that has a great deal of jargon. It could make the difference between understanding and maintaining interest or boredom and stopping dead in your tracks, because some word or idea wasn't fully explained.

Crash Course covers much of the same material as the Osborne texts, but it is easier to deal with. It's organized as a self-teaching guide, with short explanations every step of the way. It's well done and quick reading for any level. If there are any teachers out there, this book has your whole year's lesson plans worked out for you. If you're only looking to get additional information on a particular point, this book is the easiest with which to work.

The four books in example 1 contain all the information you will need to get a good start and a firm background in computers. Joseph Rosenman confessed to me that, every now and then he still refers to Volume 1, whenever he needs to be refreshed on some inside information.

EXAMPLE 1. COMPUTERS IN GENERAL

P=price V=What I think it's worth

An Introduction to Microcomputers vol 0, The beginner's book
Osborne/McGraw-Hill by Adam Osborne and David Bunnell
P= 7.95 V= 8.00

An introduction to Microcomputers vol 1, Basic concepts
Osborne/McGraw-Hill by Adam Osborne
P= 12.50 V= 25.00

Running Press Glossary of Computer Terms, An insider's guide
to the language of the experts
Running Press by John Prenis
P= 2.95 V= 5.00

Crash Course in Microcomputers
Howard Sams inc. by Louis E. Frenzel jr.
P= 19.95 V= 22.95

EXAMPLE 2. BEGINNERS AT BASIC

Learning TRS-80 Basic for the Models I, II/16, and III
Compusoft by David A. Lien
P= 19.95 V= 35.00+

Learning level II
Compusoft by David A. Lien
P= 15.95 V= 16.00

TRS-80 Data File Programming Model I/III
(also called Data File Programming in Basic)
John Wiley and Sons inc. R.S. Cat. No. 62-2085
by Finkel and Brown
P= 11.95 V= 14.95

Basic Programmer's Notebook
Howard W. Sams & Co. Inc. by E. R. Savage
(a good book, overpriced) P= 14.95 V= 7.95

As you can see, in example two there are some excellent books available for the Basic beginner. Some, however, are good (worth having), but I think are still overpriced. On occasion I go to a computer show and see some books on sale. I suggest that you do the same, and save yourself a lot of money in the process.

I suggest you pick up either of the two texts by David Lien. Either one would probably be all you'd need to learn the language or the machine. Lien's style is excellent, and his reputation for being complete is renowned, as I'm sure you have seen or heard from others. I intend to suggest its use as a reference and text at any school where I teach.

The book by Savage is a collection of Basic subroutines that can help you write better programs. The text also contains advice about how to write better programs and to stay out of trouble (avoiding bugs) to begin with. It's a worthwhile book. I wish it weren't as expensive.

TRS-80 Data File Programming is one of the best books on the subject. It is well written and easy reading. I have a lawyer friend who uses it to learn not only the language but also techniques that time and time again have saved him effort. The techniques described are applicable to game writing as well as inventory control. If you think about it, in some cases there really isn't much difference between games and inventory control. The topics covered are: clarity; readability; logic; data entry; error checking routines; sequential data file handling; and random access. There are tons of examples.

EXAMPLE 3. INTERMEDIATE TO ADVANCED

Programming Techniques for Level II Basic
R.S. Cat. No. 62-2062 by William Barden Jr.
P= 4.94 V= 9.95

Intermediate Programming for the TRS-80 Model I
Howard W. Sams & Co. Inc. by David L. Heiserman
P= 9.95 V= 10.00

Fast Basic, Beyond TRS-80 Basic (Model I/III)
J. Wiley & Sons by Gratzer and Gratzer
P= 14.95 V= 15.00

Basic Faster and Better
IJG Computer Services by Lewis Rosenfelder
(The best is overpriced) P= 29.95 V= 19.95

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PROGRAM PREVIEW

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The format of this manual is excellent from the standpoint of readability and organization. There should be no question in the reader's mind as to any procedure or discussion—the text is very understandable in this respect, even to a person not particularly adept at financial recordkeeping. The three-part explanations of all functions transforms the manual into both a tutorial manual and a quick reference guide—a format which will please users at all levels of computer literacy, from a complete novice to a professional programmer. The manual rates a 8 on our usual scale of 1 to 10.

TECHNICAL SUPPORT

VERSALEDGER II has full customer support should you encounter any difficulties. This is an increasing and welcome trend among the better program producers, and indicates an interest in more than just selling a program. A Customer Service number is provided in the documentation, for any calls of this nature.

CONCLUSION

VERSALEDGER II is probably one of the easiest programs around for any level of financial recordkeeping, from simply maintaining a personal check register to performing client writeups for multi-million dollar companies.

The fact that the computer asks for minimum data, the user provides it, and the computer and printer do everything else, makes it ideal for relatively unskilled computer operators. The fact that it can perform sophisticated financial functions makes it ideal for people with more extensive computing requirements. Finally, the fact that it can be operated at any level between a simple check register and an extensive general ledger makes VERSALEDGER II ideal for anyone who needs a record of financial activity.

VERSALEDGER II—H & E Compu-tronics, Inc. Spring Valley, N.Y.—Introductory Price until December 31, 1982: \$149.95

A. A. Wicks
30646 Rigger Road
Agoura, California 91301 ■

BITS AND PIECES

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other manufacturers. All Radio Shack printers are excellent quality and extremely reliable (especially in comparison to some of their original printers). Radio Shack gets an A-plus for their selection of printers. One warning about choosing a printer: if you plan to use your printer in a business application, buy a full sized printer (with a 14-inch wide carriage). Most business software is designed to create reports on a printer capable of printing 132 characters per line at 10 pitch. The \$1795 All-Business printer prints at 220 characters per second and is capable of correspondence quality print.

The new Radio Shack catalog does show excellent progress by Radio Shack. They are finally meeting the competition head on. ■

LETTERS TO THE EDITOR

Cassette Merge

In response to the request from Mr. William Byberg and your reply to him in reference to a Model III cassette merge program (August 1982 issue), perhaps the following will help:

Both the Model 1 and the Color Computer have had cassette merge utilities published in various magazines. Since Radio Shack maintains ROM compatibility between the Model 1 and Model 3, at least for the most part, the Model 1 merge should work on the Model 3. (The pointer addresses are the same for this particular use).

I would suggest that Mr. Byberg try this short routine:

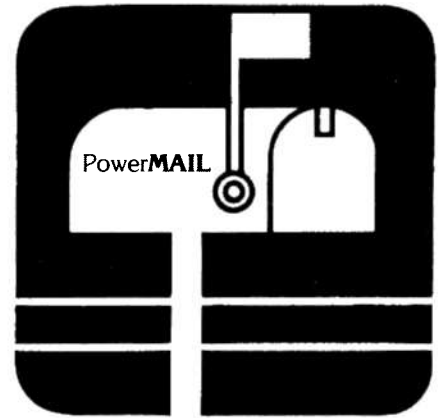
1. Write down the contents of 16633 and 16634 after loading the first program.

2. If 16633 is 2 or more, subtract 2 from it; poke this value into 16548. Also poke 16549 with the value in 16634.

3. If 16633 is less than 2, add 254 to the value in 16633 and poke it into 16548. Also subtract 1 from the value in 16634 and poke it into 16549.

4. CLOAD the second program.

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THE MOST POWERFUL, FLEXIBLE DISK MAILING SYSTEM FOR THE TRS80

SUPPORTS 65,000 NAMES

PowerMAIL is a highly sophisticated mass mailing system designed to run under all of the popular DOS's currently available for the Mod I or III. The program is written entirely in machine language for maximum operation speed, and occupies only 4K of the available RAM in your computer. There are no 'slow' periods when PowerMAIL is running. New features have been added to the program that others have always lacked. You now have the ability to keep track of mailings using the 24 'flags' that are incorporated into the PowerMAIL program. The PowerMAIL system will handle a file up to 8 megabytes, or 65535 names, whichever is smaller. The program will run in as little as 32K and one disk drive, although 48K and 2 drives are desirable. The program will also sort the entire maximum file size and open up to 168 files simultaneously during the process. Author Kim Watt.

For MOD I/III...\$99.95

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Scriplus is a modification to Scripsit™ which enables you to take advantage of the special functions, features, and print formats of your printer while your document is being printed. Allows you to:

change expanded print
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- Compatible with all current DOS's (I or III).
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- Files can be killed, loaded, merged, or chained from the Scriplus directory.
- Scriplus supplies an ALPHABETIZED directory with FREE space shown.
- "END" returns to DOS READY instead of rebooting.
- Printer can be stopped for insertion of text or forms alignment. Inserted text can be edited prior to resumption of printing.
- Specifically written for the MX-80 but will work with any printer that accepts CHR# codes for control.
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ARRAY OF HOPE FOR BASIC PROGRAMMERS (PART 3)

Arne Rohde

5.2 Non-sequential Searching

Irrespective of the optimization techniques employed, sequential searching can become very slow as array size increases. Even with less than 10 elements in an array a non-sequential search may be faster than a sequential search, although there may be other reasons for using sequential searching instead. One of the common reasons is that the array must be stored in a particular sequence, but sometimes a search is performed on a value other than the normal key, and when more than one array element may fulfill the search conditions. For example finding all customers who have purchased more than a certain number of items in a particular month would normally be done by sequential searching if this was not the normal access requirement for the particular array, in which case it could be sorted beforehand.

Many of the non-sequential search techniques require that the array be sorted into a particular sequence on the key being searched for. Some of the sorting techniques will be covered in a later article, but we have already seen how a binary tree has an implicit sequence which can be useful for searching. For most of the following search algorithms, we shall assume that the array has been sorted in sequence before the search is executed.

5.2.1 Binary Search

One of the better known non-sequential searching techniques is the binary search. The search derives its name from the fact that for each key comparison the remaining unsearched portion of the array is divided into two parts. The search can be illustrated easily with a small array containing a number of keys in ascending sequence. We shall assume an array with 7 elements contains the key values:

1 4 9 16 25 36 49

If we are searching for the key value 9, we first look at the central element in the array, in other words the one with key value 16. Since the required key value is lower, we have restricted the remaining search to those elements with a lower key value, or the first 3 elements in the array. The next element to be compared is the center element of the portion remaining to be searched, the element with key value 4. Since the required key value is higher, the remaining search is restricted to the elements with key value larger than 4 but lower than 16. There is only one element fulfilling this condition, and this is the required element.

To find the element 3 comparisons were required, exactly the same as if the search had been sequential, starting from the beginning of the array. However this was the worst case for the binary search, whereas the worst case for the sequential search would require 7 comparisons, with an average of 3.5 comparisons for finding a random key. With the binary search, assuming the key is found, one key value requires one comparison (key 16), two

require two comparisons (4 and 36) while the remaining four require three comparisons. Three comparisons are also required to ascertain that the required key is not in the array. The average number of comparisons for finding a key with the binary search is thus $17/7$ or approximately 2.4, one less than that for a sequential search.

For arrays of this size, the binary search will not offer any measurable advantages, since more complex calculations are required before each comparison can be made. If instead of 7 elements we need to search through 127 elements, the average number of comparisons for the sequential search will be 63.5 but for the binary search it will be $(1*1 + 2*2 + 4*3 + 8*4 + 16*5 + 32*6 + 64*7)/127$, or $769/127$ which is approximately 6 comparisons on average. The worst case for the binary search is 7 comparisons, whereas the sequential search requires 127 for the worst case. On average the sequential search requires 10 times more comparisons to find a particular key, and with these array sizes the difference in speed can be quite noticeable.

To search an array A containing AE elements (with subscripts from 0 to AE-1) sorted into key sequence for the key value AR, the following code could be used:

```
100 IL=-1: IH=AE: REM Low and high searched
110 I=(IH+IL)/2: REM Find mid point for search
120 IF I=IL OR I=IH THEN PRINT "Key";AR;"not found":
GOTO 150: REM Subscript already used
130 IF A(I)>AR THEN IH=I: GOTO 110
ELSE IF A(I) < AR THEN IL=I: GOTO 110
140 PRINT "Key";AR;"found at position";I
150 etc.
```

It is also assumed here that the subscript values I, IH, and IL are defined as integers. IL points to the lowest subscript which has already been compared, and IH to the highest subscript which has been compared. Initially these values are just outside the range of the array, since none of the elements have been compared. If we look at the 7-element array again (AE=7 and AR=9), the execution sequence will be:

```
100 IL=-1:IH=7
110 I=3
120
130 IH=3 since A(3)>9
110 I=1
120
130 IL=1 since A(1)<9
110 I=2
120
130
140 "Key 9 found at position 2"
```

The code for the binary search is relatively compact and should be easy to follow, but there are a few points to note concerning the efficiency of the code. The first is that either one or two comparisons are made to check the key value, and two comparisons will be made for the required

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JUST LIKE FIRE

Michael Herbert Shadick

We've all heard the same or similar claims to the effect that computers are somehow capable of changing us as human beings, or even that they will eventually (horror of horrors) render us somehow less than human. Such claims are, of course, not only complete hogwash, but do in fact fly in the face of human history. Indeed, to even utter claims such as these is to overestimate the computer's power over us, and, even more significantly, to grossly *underestimate* our own powers and capabilities.

I ask you: has the coming of the computer age changed us, or even *threatened* to change us, for example, physically? The answer is (with the possible exception that we might be becoming slightly more sedentary, cerebral creatures)—of course not! Likewise, computers cannot change us in any other way—not emotionally, not spiritually, not even, if you will, metaphysically! Unless, of course, we *wish* to change in any (or all) of those areas. And then, the computer can serve as a most effective tool in helping us bring about whatever changes we desire in ourselves.

Computers, then, are no less—and no more than *tools*. The same can be said of the hammer, or of the loom, or of the telephone, or of any of humanity's other inventions. For each of them, in their own ways, have altered the course of human history. Yet it isn't our race's inventions *per se* which change things, but rather, the ways in which we use them. That's a mighty important distinction, which the so-called "computer critics" invariably fail to appreciate. It was, is, and always will be we who use our inventions, *not* vice versa. The computer is just another tool in our hands—albeit doubtless one of the most potent ones our species has ever possessed.

Fire, in the early days of its conquest by our prehistoric predecessors, was probably accused of the same things which computers are accused of today. Certainly the conquest of fire *did* change the lives of its conquerors! But the species itself—*our* species—was then, and is now, relatively rigid and rather fixedly

inflexible. We—each and every one of us—have the same basic needs, the same wants, and the same desires as those of our parents, our great-grandparents, or of our ancestors from however far back one wishes to go. The underlying configurations of human existence remain constant from generation to generation. The only aspects of our individual and collective existence which *do* change, then, are the ways in which we meet our needs, wants, and desires. That is, the *tools* we use to get what we want out of life.

There has never been a better tool, nor one with greater and more far-reaching capabilities and potentialities, than the computer. So in that regard, computery will doubtless continue to have increasingly profound effects on our lifestyles. But to say that the computer will *change* us, altering who and what we are—I wouldn't bank on it, not for a nanosecond! Ours is, after all, a mighty (and mighty *durable*) species. We have conquered ever more sophisticated natural phenomenon, and have turned those forces of nature into tools at our beck and call. Fire itself was one of our race's earliest major conquests. Electrical energy, as utilized in today's computers, is one of our latest major conquests—but, without a doubt, not our last. Fire and computers have this in common: they represent natural forces which have always been around us, but which we have now placed in our hands. They—the forces, whatever they may be—are not about to take control of the very species which conquered them!

So the next time some self-styled skeptic tells you that computers are "taking over" or some such inanity, you might reply with a statement to this effect:

"Yes, computers are beginning to effect every facet of our lives . . . just like fire!"

Everlastingly at it,

Michael Herbert Shadick
Cedar Square West, Apt. E-414
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ARRAY OF HOPE FOR BASIC PROGRAMMERS

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key value. This tends to slow down the search slightly, compared to the sequential search which only uses a single comparison. Another factor is that a specific test is made to terminate the search when the key is not found. This was not necessary for the sequential search, and again it will slow down the binary search. The loop CAN be coded in a single line to speed up processing slightly, but the legibility suffers accordingly. The single line, replacing lines 110, 120 and 130 in the above code, could be as follows:

```
110 I = (IH + IL) / 2:
    IF IH - IL <= 1 PRINT "Key"; AR; "not found": GOTO 150
    ELSE IF A(I) > AR THEN IH = I: GOTO 110
    ELSE IF A(I) < AR THEN IL = I: GOTO 110
```

The termination condition has been changed so that it requires only a single IF statement, and the key comparisons can be made in the ELSE portion of this comparison. If speed is the main objective then this version, perhaps with deletion of unnecessary spaces, could be used. For even faster speed the termination test could be moved, since it is executed unnecessarily when the key is found and on the first pass. The reason for the present position is that the code will execute correctly if the array contains zero elements, and if it were moved after the key comparisons it would have to be duplicated, once for a lower key and once for a higher key.

In a test to compare the speed of a sequential and a binary search an array containing the integers in ascending sequence was constructed. A search was then made with 50 random integers, most of which would be found in the array, and with different array sizes. The following times were obtained, but since the search keys were generated with the RND function, they cannot be reproduced exactly. The times, however, are representative of the time differences which can be expected as the array size increases.

# array elements	Time in seconds to find 50 key values Sequential	Binary
15	8.2	6.7
31	16.7	8.5
63	30.6	10.8
127	54.1	12.0
255	118.4	13.8
511	233.0	15.1
1023	458.9	17.3

The sequential search times are approximately doubled for each doubling of the array size, whereas the binary search has an almost constant increment in time for each doubling of array size. These observations correspond closely to the theoretical values expected for the search times.

5.2.2 Combined Searching

The binary search requires a division by 2 to calculate the subscript of the next array element to be compared. In some programming languages this division or subscript calculation may not be simple, or it may be time consuming. To avoid this calculation a combined search method can be used, the first part of the search consists of comparing elements at fixed distances from each other until an element with a higher key value is encountered. The next

part consists of a sequential search from this point until the required key value is found, or it is determined that the value cannot be found. The number of comparisons required is considerably less than that for a pure sequential search, but greater than that for a binary search. The ideal distance for the first part of the search would be the square root of the number of array elements, giving an average total number of compares equal to this value. Thus 10 compares would be required for an array with 100 elements on average, compared to 50 for a sequential search and slightly less than 6 for a binary search. The code in Basic is slightly more complex than either of the other methods since two search loops are required, and the method would probably not be useful as a Basic routine, but in assembler or other languages it could be a useful addition to the non-sequential search repertoire. Using our array and variable definitions as before the algorithm can be coded as follows:

```
100 I = 0: IS = SQR(AE) + 1: REM Make step non-zero
110 IF I + IS < AE:
    IF A(I + IS) <= AR THEN I = I + IS: GOTO 110
120 IF I < AE: IF A(I) < AR THEN I = I + 1: GOTO 120
    ELSE IF A(I) = AR PRINT "Key"; AR; "found": GOTO 140
130 PRINT "Key"; AR; "not found"
140 etc.
```

The two search loops are in line 110 and line 120. The first loop steps through the array until a key value higher than the desired one is found. The sequential search then continues from the previous value which was not higher than the desired value. Obviously we do not need to extract the square root of the number of elements in order to use the method, and for arrays of reasonably static size a constant would be used instead. For arrays which vary considerably in size a simple calculation or array lookup could be used instead to find an appropriate step value. The square root is used here since it yields the optimum step value for any array size. As in the example it would be necessary to ensure that the step value is greater than zero, irrespective of the size of the array.

If we have an array with 15 elements containing the values from 0 to 14 (corresponding to the subscripts) and we need to find the element with key value 11 then the execution sequence for the routine will be as follows:

```
100 I=0: IS=4
110 I=4 since A(4) < 11
110 I=8 since A(8) < 11
110
120 I=9 since A(8) < 11
120 I=10 since A(9) < 11
120 I=11 since A(10) < 11
120 "Key 11 found"
140
```

5.2.3 Binary Tree Search

We have already looked at the structure of a binary tree, and how a binary tree can be traversed if the appropriate pointers are present for each element. For searching only the normal left and right pointers are required, but we shall assume that the negative pointers useful for traversing are

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LETTERS TO THE EDITOR

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5. Poke 16548,233 and poke 16549,66.

6. LIST the combined program.

The above routine assumes that the second program has line numbers higher than those of the first program. If not, a simple renumber routine can be used. In that case, it is necessary to load the second program, renumber it, save it back to cassette, then load the first program and proceed as above.

C. Russell Eurich
150 Sunrise Lane
Pottstown, PA 19464

Inserting Diskettes

In a recent issue, you refer to how important it is to close the drive door correctly in order to minimize disk thrashing. Could you describe the correct step-by-step procedure that insures that the disk will do just that — correctly lock into place?

Andy Chakires
1704 Miramar St.
Los Angeles, CA 90026

It's tough to describe this as a procedure, since there are so many different makes of disk drives that are all slightly different. The problem that occurs is that the diskette is not properly grasped by the plastic knob that grips the hub and holds it in place while it spins. If it is slightly off center, the hub can be bent or frayed, and of course the diskette will not be read correctly.

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ARRAY OF HOPE FOR BASIC PROGRAMMERS

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present in the array. The same definitions as for the sequential traversal will be assumed. The code for a binary tree search could be as follows:

```
100 NXT = ROOT
110 IF NXT <= 0 PRINT "Key"; AR; "not found": GOTO 140
120 IF A(NXT,KEY) < AR THEN NXT = A(NXT,LEFT): GOTO 110
    ELSE IF A(NXT,KEY) > AR THEN NXT = A(NXT,RIGHT): GOTO 110
130 PRINT "Key"; AR; "found at location"; NXT
140 etc.
```

Again the loop could be reduced to a single line to the detriment of the legibility of the code. It can be done simply by appending line 120 to the end of line 110 with the word ELSE as separator.

Depending on the shape of the tree the binary tree search can be as fast as the binary search or as slow as the sequential search. If the length of any branch belonging to a particular node differs from any other branch belonging to the same node by no more than one, then the tree is said to be balanced. For balanced trees the search time will be approximately the same as for the binary search. The other extreme is obtained if the tree only consists of a single branch with a length equal to the number of elements in the tree. This would correspond to a linear linked list, and the search time would be equivalent to the time for a sequential search. To avoid the worst case example the tree can be reorganized so that it will be balanced and faster search times will be obtained. The reorganization requires processing time, and corresponds to the sorting of an array.

5.2.4 Direct Reference

The fastest search method possible is obtained when the array can be built so that the key value directly corresponds to the subscript of the corresponding array element. The search is then a direct reference to the particular array element required. If not all elements are used, then a value must be stored in the array to indicate if the particular element is used or not.

For example a company has about 200 employees, each of which is assigned a three digit number between 100 and 999. An array could be built containing about 200 elements, but a more efficient search could be obtained by using an array of 900 elements, corresponding to the employee numbers from 100 to 999. To find the corresponding array element the value 100 would be subtracted from the number, yielding a subscript in the range of the array. The array perhaps contains the weekly wage for each employee, and this value could be set to -1 if the corresponding employee number was unused. Admittedly a great deal of memory space would be wasted, but if speed is of more importance then memory space then the method can be recommended.

In the above example the array utilization is only about 22%, but in many cases where normal arrays are used the percentage would be much larger. There is no reason to have large amounts of unused memory in the computer if it could be used to advantage to speed up array searches.

The example showed an obvious key transformation, but in other cases the transformation may not be quite as obvious. The only requirement is that the transformation yields a unique subscript value within the range of the array, in other words two distinct key values may not yield the same subscript value. Many identification numbers are obtained by appending a check digit to the end of a value within a certain range. The employee number in the above example could have been a four digit number, with the last digit being a check digit. In this case the first three digits in each number are still unique, and if the check digit has been verified by other methods then the first three digits could still be used to obtain a direct subscript value.

For very large arrays the method can be an order of magnitude faster than the binary search, besides having the advantage that the array does not have to be sorted beforehand. Thus if additions to the array or deletions are common, then the method becomes even faster compared to the binary search or the binary tree search. It is my impression that the technique is not used as often as it could be, despite the obvious advantages to be gained by using it, but perhaps as memory becomes cheaper and microcomputer addressing ranges expand the method will gain in acceptance.

5.2.5 Hash Code Calculation

A method of array organization which is closely related to the direct lookup is the hash code calculation. The difference is that in the direct lookup the key can be transformed to a unique subscript, whereas the hash code calculation will not yield a unique value. It can be used where the range of key values is large compared to the number of positions available in the array. It is used extensively in compilers for storing a table of names defined in the program.

The calculation required to convert the key value to a subscript value will vary from one application to the next, but it should be chosen so that the subscript values are reasonably evenly spaced throughout the available range. A common method is taking the remainder after division by a value, often a prime number, corresponding to the number of elements in the array. To avoid having too many keys yielding the same subscript value the array should be defined with more elements than actually needed. No fixed rules can be given, but arrays with more than 70 to 80% utilization will often give extended search times.

When two different key values yield the same subscript in the hash code calculation, a clash results, and a method must be found to distinguish the two keys and to provide storage for both the key values. The key itself is stored in the array, so that the actual value can be checked with the desired value, resulting in more space being required than for the direct lookup where the key value does not have to be stored. To resolve clashes the key can be passed through a new transformation to yield a new subscript value, or a separate portion of the array can be reserved and searched sequentially to find those elements which have resulted in clashes. If many clashes are expected, then each element can contain a link pointing to the next

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element with the same hash code value.

In order to use hash code calculations the key need not be a numeric value, string values can be converted to a numeric value by performing a transformation on the ASCII values of each or some of the characters in the string. The length of the string can also be used in the calculation. The TRSDOS operating system contains several examples of hash code calculations. One of them is used to transform the file name of disk files to a one-byte value stored in one of the disk directory sectors known appropriately as the Hash code Index Table (or HIT) sector. The value is used to speed up the directory search for a particular file. If the calculated hash code is not found in the HIT sector then the file does not exist on that diskette, if it is found then the corresponding sector in the File Directory Entry (or FDE) sectors can be read directly. If several files on the diskette yield the same hash code then the HIT sector and FDE sector reads will have to be repeated until the appropriate file is found. The file name itself is stored in the FDE sector so that the value can be verified since clashes are not uncommon.

Another example of hash code calculation, which in this case is not used for table lookup, is the conversion of the file passwords to two-byte integer values stored in the directory. Since two bytes can contain 65536 distinct values the probability of a clash is much lower than for the HIT codes which can only contain 256 distinct values.

For the HIT codes the ASCII values of each byte of the file name is used. A sequence of Exclusive OR and rotate commands are used, a sequence which would be difficult to reconstruct in Basic. However a similar sequence can be used, but instead of rotating the value it can be multiplied by two before the next ASCII value is added, and if a certain value is exceeded it is subtracted from the calculated value to avoid overflow. Also the length of the string can be used as the start value for the hash code. The following code can be used to yield a value between 0 and 1023 for a string A\$ of any length.

```
100 HC = LEN(A$): IF HC = 0 THEN 150
110 FOR I = 1 TO LEN(A$)
120 HC = HC + HC + ASC ( MID$ (A$, I, 1))
130 IF HC > 1023 THEN HC = HC - 1024: GOTO 130
140 NEXT I
150 etc.
```

Any value other than 1023 could obviously have been chosen to yield a hash code value within any desired range. Note that the value of HC in line 130 can be larger than 1023*2 so that 1023 may have to be subtracted more than once. For short arrays the above calculation requires more time than a sequential search, but for large arrays, especially dynamic arrays where the time required for inserting a new element in sorted sequence may be longer than the search time, the calculation time will be insignificant.

In the following example the elements with clashing hash code values are placed in a separate portion of the array, and either searched sequentially or through a linked list from the main part of the array. The array will consist of

two dimensions with 1200 rows and two or three columns. The columns will contain the key, the data portion, and optionally a pointer to the overflow portion of the array. The largest calculated hash code will be 1023, so the elements from 1024 to 1199 will be used for overflow due to hash code clashes. The array has been initialized so that unused elements contain a key value of -1, and for the linked version, the unused links will also contain the value -1.

Since the overflow portion of the array can only contain a limited number of elements it may also overflow. If and when this occurs the hash code calculation and the array size should be revised to reduce the number of clashes. The search part of the routine can be coded as follows, first for the unlinked version:

```
10 HM = 1024: SM = 1200: REM Hash code and subscript
   maximum values + 1
...
100 IF A(HC, KEY) = AR
   PRINT "Key"; AR; "found at location"; HC:
   GOTO 160: REM Found at hash code position
110 IF A(HC, KEY) = -1 THEN 150: REM Key not found
120 HC = HM
130 IF A(HC, KEY) = AR
   PRINT "Key"; AR; "found in overflow location"; HC:
   GOTO 160: REM Found in overflow portion
140 IF A(HC, KEY) >= 0 THEN HC=HC+1: IF HC < SM THEN 130
150 PRINT "Key"; AR; "not found"
160 etc.
```

Note that if the required key is found at the expected position then only a single comparison is required. Thus if there are no clashes only a single comparison is required, irrespective of whether the value is found in the array or not. Thus for speed the hash code calculation method can compare with the direct lookup. If clashes do result then the calculation of the average number of comparisons is complicated, but it can be done if the number of clashes is known, together with the number of elements present in the overflow portion of the array.

The routine when a link is used is very similar to the above, but the number of comparisons will be reduced if a relatively large number of elements are present in the overflow portion.

```
100 IF A(HC, KEY) = AR
   PRINT "Key"; AR; "found at location"; HC:
   GOTO 130: REM Found at expected location
110 HC = A(HC, LINK): IF HC >= 0 THEN 100:
   REM Check at link location
120 PRINT "Key"; AR; "not found"
130 etc.
```

As can be seen the code for this case is simpler than that for the unlinked version, and the loop portion of the code could easily be written as a single line to improve the efficiency slightly. The average number of comparisons is again dependent on the number of clashes, and the number of elements in each link, but it should be very close to one except for very exceptional cases. The disadvantage compared to the unlinked version is, of course, the extra memory required to contain the links in the array.

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COLOR COMPUTER CORNER

Joseph Rosenman

This Month: 6809 Assembly Language and Galax Attack

How does the Color Computer do it? We all know that there is a microprocessor inside the Color Computer, known as the 6809. The 6809 processor is part of a family of microprocessor, manufactured by Motorola. The first in this family is the 6800 (used in the PET computer). The 6809 is an advanced version of the 6800 (they are both 8 bit CPUs). The newest in the family is the 68000 (used in the Radio Shack Model 16). The 68000 is a 16 bit processor, and is an extremely powerful processor.

OK, the Color Computer uses a 6809 processor. How can we learn about it? We can begin with a book on the subject. This month, I will review a book on 6809 Assembly Language. Next month, I will review the Radio Shack Color Computer EDTASM program. Assembly Language/Machine Language is the only way to really understand the inner workings of any computer. Many of the readers of the Color Computer column know of the Assembly Language for Beginners column that I have been writing in *Computronics*. The first four issues contain a great deal of information useful in learning any Assembly Language (the column is focused on the Z-80 microprocessor used in the Radio Shack Models 1, 2, and 3). If you have a serious desire to learn about assembly language, you might want to review these issues. These issues deal with concepts relevant to any assembly language.

6809 Assembly Language Programming

by Lance Leventhal
Osborne/McGraw Hill, 1981

There have been several books on different microcomputer assembly language programs published by Osborne, all with a reputation for thoroughness and accuracy. The 6809 assembly language book continues their tradition. This large paperback book include 22 chapters detailing the history and use of the 6809. Appendices detail the machine code. 6800 compatibility and differences are described. Of course, numerous examples of the use of the machine instructions are provided throughout the book.

All Osborne books use a double intensity print system to aid readers. Important or main points are "highlighted" (darker), so that the reader could skim through the book and pick out the main details. The normal print contains the explanations and examples. This system permits a rapid review of material. My impression of this book is that it is of the usual high standards I have come to expect from Osborne. Who is the book targeted for? Not the absolute beginner. Although the book begins with introductory material, I would not recommend it to the novice. If you have some experience in assembly language (that is, if you know something about hexadecimal math or have started to learn another assembly language), this book should prove excellent. As far as the highly trained are concerned, the book is useful. Having worked on several assembly

languages in the past, I found that this book required a lot of reading to get to the facts. I would have preferred an approach that included a description of the processor architecture, followed by a table of assembler mnemonics and functions. I must stress, though, that most readers will find the book's detail to be a tremendous asset. If you intend to work with an 6809 assembler, I highly recommend this book.

GALAX ATTACK

from: Spectral Associates
141 Harvard Ave.
Tacoma, WA 98466
206-565-4607

System requirements: 16K or 32K system (non-extended Basic).

Supplied on: Cassette tape. Joysticks required.

Disk compatible: Yes.

Price: \$21.95

Spectral Associates has come out with another high quality arcade game. Galax Attack is another variant of the legendary "Space Invaders." In this game there are three different ship types. Points gained from a hit are doubled if the alien ship was attacking when fired upon. The graphics are interesting and appropriate. The game maintains a fast pace, and has suitable sound effects. Your ship is controlled by the right joystick (missiles are fired by depressing the joystick button).

Problems? Just two. I find that the joystick is not very responsive. In addition, the missiles dropped by the alien ships are not very distinctive (they resemble the background stars). I suppose one could say that the missiles are "camouflaged." In any case, with the exception of these two deficiencies, the game is quite good. Needless to say, the game is in machine language and uses high resolution graphics.

Have you noticed the amount of Color Computer software around? I am happy to say that it has increased dramatically. Radio Shack has continued a slow but steady increase in Color Computer software. Far more important, however, is the increase in independent software and hardware sources. When I think back to the software available just one year ago, I find the changes quite satisfying. Now, a Color Computer user has a large choice of software. What about the Color Computer itself? Radio Shack has offered virtually no additions to the Color Computer. There is still a limit on the maximum memory size (32K). Mass storage is, well, not very mass (by today's standards, the Color Computer Floppy Disk is small potatoes). Radio Shack made its usual unfortunate choice with the Color Computer lower case. There are several lower

continued on page 39

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PRACTICAL BUSINESS PROGRAMS

Steven M. Zimmerman, Ph.D. and Leo M. Conrad

THE GRAPHICAL METHOD OF LINEAR PROGRAMMING FOR SOLVING SIMPLE BUSINESS PROBLEMS

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The Graphical method of linear programming is both a solution procedure for simple problems and a demonstration method to aid in the understanding of this type of problem. This program draws both line and area graphs associated with two dimensional problems. An adaption of the Simplex method, published in the September 1982 issue of this magazine, is then used to produce an analytical solution to the program.

The graphical method of linear programming allows the business person to make a decision concerning two variables. These variables may be relative to any decision the business person must make. For example, the number of first class salespersons versus the number of trainees to be assigned to a particular office, or the amount of a given product to stock versus the amount of a second product to stock in a retail store, or the dollars to budget for one research project versus a second project.

If you have a problem involving more than two decisions, then the Simplex method must be used. The reason the graphical method is limited to two decisions is that we can only plot in two dimensions. The graphical method is primarily a visualization method and secondly a solution procedure.

A Sample Problem

Assume you are the owner operator of the local Computer For Sale Store. You must decide the number of IBM Personal Computers and the number of Apple II computers you will stock. You know the contribution margin (difference between the selling price and the purchase price per unit) on the IBM PC is \$1500 for a typical unit sold, while the contribution margin for the Apple II is \$1600.

You are limited by the display and storage space you have available to stock only ten computers. In other words, the number of IBM computers stocked plus the number of Apple computer stocked must be less than or equal to ten.

In addition, you have a budget problem. Your combined credit and cash allows you to stock up to \$12,000 worth of goods as measured by their purchase price. The cost of a typical IBM unit is \$3,000 while the price of a typical Apple II computer is \$2,500.

You are working under one more constraint: that you must stock a minimum of three IBM computers in order to keep the franchise. You assume that you will be able to sell all of the units you must stock in a given time period.

Setting up Our problem in terms of Equations

The objective of the problem is to maximize the sum of the contribution margins. We write the following equation:

Contribution times IBM's + Contribution times Apples
Margin Margin

$$\$1,500 I + \$1,600 A$$

This equation is called the objective function.

The constraints are first stated in words and then as equations:

Number of IBM's plus Number of Apples less than or equal to room

$$I + A \leq 10$$

Cost times IBM's Plus cost times Apples is less than or equal to budget.

$$\$3,000 * I + \$2,500 * A \leq \$12,000$$

The last constraint is that you must stock at least three IBM PC's:

$$1 * I + 0 * A \geq 3$$

Using the Program

The program may solve both maximization problems, like the example, and minimization problems. In the case of maximization problems, all constraints must be less than or equal to, and in the case of minimization, all constraints must be greater than or equal to. In our sample problem all constraints fit the pattern except the last one.

In order to make the last constraint relative to stocking a minimum number of IBM PC's, we multiply both sides of the equation by -1 to turn the sign around. The constraints now look like the following:

$$-3 I - 0 B \leq -3$$

The equation looks strange, but it will work, and that is what counts.

We are now ready to run the program. The first thing seen on the screen is:

```
GRAPHICAL METHOD OF LINEAR PROGRAMMING
DEVELOPED BY:
STEVEN M. ZIMMERMAN, PH.D.
LEO M. CONRAD 1982
OBJECTIVE FUNCTION A * X1 + B * X2 ... INPUT A & B?
```

X1 is used for the first variable, in our case the number of Apple II computers, and X2 is used for the second variable, the number of IBM PC's. The value of A is the contribution margin for IBM computers, \$1,500, and the value for B is \$1,600 the contribution margin for Apple

continued on page 30

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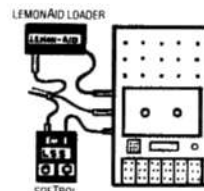
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PRACTICAL BUSINESS PROGRAMS

continued from page 28

computers. We input 1500,1600 as the answer to the above question.

Next on the screen will be:

FOR MAXIMIZATION ALL CONSTRAINTS MUST BE $A \cdot X_1 + B \cdot X_2 \leq Z$
FOR MINIMIZATION ALL CONSTRAINTS MUST BE $A \cdot X_1 + B \cdot X_2 \geq Z$
THE NON-NEGATIVITY CONSTRAINT FOR ALL VARIABLES ASSUMED
1 MAXIMIZATION, OR 2 MINIMIZATION ?

We have not spoken of the built-in constraint that all variables must result in answers which are greater than equal to 0. In business problems, this is a common limitation, and we have selected a solution procedure with this limitation built in.

Since our objective is to maximize profit, we type 1 and hit ENTER.

Next on the screen is:

NUMBER OF CONSTRAINTS ?

There are three constraints. One due to room, one due to budget, and one due to contract comment. We type 3 and hit the ENTER key.

The next question is:

COEFFICIENTS OF X_1 AND $X_2 \leq$ OR \geq Z ?

The values of the three constraints are:

Equation #	Coefficient of X_1 IBM's	Coefficient of X_2 Apples	Constant
1	1	1	10
2	3000	2500	12000
3	-1	0	-3

The above question will appear three times. We answer with the numbers in the table above. When complete, we see this on the screen:

UPPER LIMIT OF X_1 ?

The program is designed to handle a large variety of problems. You the user must select the scale which gives you the best picture for the problem under study. We have designed the program to recycle, so as to allow the user to try different scales to obtain the best picture for the purpose of the analysis. In this case we selected 10 as the upper value of X_1 , because this is where the line for the maximum number of computers to be stocked crosses the Apple axis. In a similar manner we selected 10 as the answer for the next question.

UPPER LIMIT OF X_2 ?

The next question is relative to the frequency of plotting the graphs. If you select too small a number, the graph will be skimpy; if you select too large a number, the amount of time needed to draw the picture will be very long. Start with the specification of 100 for this variable and then try different values to see which approach fits your needs the best.

INCREMENT (100+) ?

Next on the screen will be:

PRINTER (Y/N) ?

We have designed our printer copying routines for printers without graphic abilities. The screen results are much better than you can get from such printers. The results are of value and useful for reports if care is taken to select the scales to fit the abilities of the printers. We will assume that you have a printer, that it is running, and that you wish to have printer output of the results. In actual use we recommend that you spend some time in getting the scales set on the screen before using the printer to copy results.

The next question is:

TITLE & DATE ?

We make it a practice to identify and date all output which is sent through the printer. Put in any title and date you wish. The date should be put in the form of MO/DA/YR.

The next question is:

COPY LENGTH (3,6) ?

We have two copy routines in the program. Depending on the detail needed, you may prefer one to the other. Try both just to see what happens. We used 3 in our sample run.

Next on the screen will be:

AREA OR LINE PICTURE ?

Two graphing routines are available. One plots the constraints as a line, and the other whites out the area where the constraint restricts the solution from occurring. We have found both pictures useful at different times. It is possible to end up with a screen which has been completely whited out when selecting the AREA option. If this happens, we say the solution is degenerate, or there is no feasible solution to the problem.

We typed AREA at this time in our sample run and watched the picture being drawn. We almost had a unfeasible problem with the constraints we had defined in our sample problem. As you watch the picture being drawn, note how the first constraint is completely dominated by the second constraint. The amount of room available to stock computers is more than it needed.

After the picture has been drawn and a copy made by your printer, you are told to hit ENTER to continue. Do so and you will see on the screen:

ACTION MENU

G NEW GRAPH

R RECYCLE

S SIMPLEX SOLUTION

SELECTION ?

As noted, you are now able to redraw your picture again and again in order to select the best picture for the problem under study. You may also recycle or use the built-in Simplex procedure for solving the problem analytically. We selected this option, and now we will examine

the final simplex tableau which results.

The tableau looks like the following:

SOLUTION OPTIMAL

	X1	X2	S1	S2	S3	
S1	0.00	0.00	1.00	-0.00	0.00	5.80
X1	1.00	1.20	0.00	-1.00	0.00	3.00
X2	0.00	1.00	0.00	0.00	1.20	1.20
	0.00	0.00	0.00	0.64	420.00	%6420.00

X1 = 3

X2 = 1.2

IF AN X DOES NOT APPEAR IT IS ZERO

VALUE OF OBJECTIVE FUNCTION 6420

In the case of a maximization problem, the solution is found by looking down the first column for X1 and X2. In this case both are found. This means that both computers should be stocked. The number of IBM computers which maximize the contribution margin is 3.0. The number of Apple computers is 1.2. This means three IBM computers should be stocked and either one or two Apples. In mathematical problems constraints are fixed. In real life constraints are approximate. The two alternate decisions may be examined and the question reviewed.

Warning—Nothing's Perfect

The program's analytical solution is based on a Simplex algorithm, which is a step-by-step procedure for solving this problem. The Simplex algorithm is subject to a condition called "degenerate." When this condition exists, the algorithm will recycle forever or yield a false solution, not taking one or more of the constraints into account. Sometimes you can get around this condition and obtain a useful result by putting the variables into the computer in a different order, or changing the order of the constraints. The solution will still be degenerate, but you will be able to obtain a workable result.

The degenerate condition is not the same as an impossible set of constraints. Degeneracy may exist even when a solution is possible. If the constraints are put in such that no solution is possible, the algorithm will also give unusable results. The graphical picture will tell you what is happening in this case.

```
10 CLEAR 500:CLS:REM      "LPGRAPH
20 CLS: PRINT "GRAPHICAL METHOD OF LINEAR PROGRAMMING":
PRINT "Copyright ": PRINT "STEVEN M. ZIMMERMAN,PH.D. ":I=0
30 PRINT "LEO M. CONRAD  1982"
40 INPUT "OBJECTIVE FUNCTION A * X1 + B * X2 ... INPUT A &
B":A,B
50 GOTO 620
60 INPUT "NUMBER OF CONSTRAINTS":NE:C%=NE: FOR I=1 TO NE:
INPUT "COEFFICIENTS OF X1 AND X2 <= OR >= Z":A(I),B(I),C(I):
NEXT
70 INPUT "UPPER LIMIT OF X1":TX:SX=0
80 INPUT "UPPER LIMIT OF X2":TY:SY=0
90 INPUT "INCREMENT (100+-)":JJ: INPUT "PRINTER (Y/N)":P$:
IF P$="Y" THEN INPUT "TITLE & DATE":T$,D$: INPUT "COPY LENGTH
(3,6)":CL
100 INPUT "AREA OR LINE PICTURE":AL$
110 CLS: FOR I=0 TO 43: SET(22,I):NEXT
120 FOR I=22 TO 125: SET(I,43):NEXT
```

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```

130 I=7: FOR J=64 TO 832 STEP 128:I=I-1: PRINT @J,
(SY+I*(TY-SY)/6);: NEXT
140 I=-1: FOR J=970 TO 1015 STEP 9:I=I+1: PRINT @J,
(SX+I*(TX-SX)/5);: NEXT
150 GOTO 180
160 PRINT @22,"PRESS ENTER TO CONTINUE";
170 Q$=INKEY$: IF Q$="" THEN 160 ELSE 680
180 S=(TX-SX)/JJ
190 IF AL$="AREA" THEN 250
200 FOR I=1 TO NE:HH=1: FOR X=SX TO TX STEP S:Y=999999:
IF B(I)<>0 THEN Y=-A(I)/B(I)*X+C(I)/B(I) :REM THIS IS THE
CONSTRAINT EQUATION
210 E=23+((X-SX)/(TX-SX))*93:F=40-((Y-SY)/(TY-SY))*37:
IF E>5 AND E<126 THEN IF F>0 AND F<43 SET(E,F)
220 IF E<5 OR E>126 OR F<0 OR F>43 PRINT @61,"***";:
FOR L=1 TO 3:R=RND(100): NEXT L: PRINT @61," ";
230 IF A(I)<>0 AND HH=1 THEN H=INT(X): IF B(I)=0 AND
H=INT(C(I)/A(I)) THEN FOR H=0 TO 42: SET(E,H): NEXT H:HH=0
240 NEXT X,I: GOTO 490
250 IF M%=2 THEN 370
260 FOR I=1 TO NE:HH=1: FOR X=SX TO TX STEP S:Y=999999:
IF B(I)<>0 THEN Y=-A(I)/B(I)*X+C(I)/B(I) :REM THIS IS THE
CONSTRAINT EQUATION
270 E=23+((X-SX)/(TX-SX))*93:F=40-((Y-SY)/(TY-SY))*37:
IF E>5 AND E<126 AND F>0 AND F<43 AND B(I)>=0 AND C(I)>0
SET(E,F): FOR RX=F TO 0 STEP -1: SET(E,RX): NEXT : GOTO 360
280 IF Y<0 AND B(I)<>0 AND C(I)>0 : FOR RX=43 TO 0 STEP -1:
SET(E,RX): NEXT : GOTO 360
290 IF E>5 AND E<126 AND F>0 AND F<43 AND B(I)<>0 AND C(I)<0
SET(E,F): FOR RX=F TO 43 : SET(E,RX): NEXT : GOTO 360
300 IF B(I)=0 AND A(I)<>0 AND X<(C(I)/A(I)) AND C(I)<0 THEN
PRINT @61,"***";: FOR L=1 TO 3:R=RND(100): NEXT : PRINT @61,
" ";: GOTO 360
310 IF B(I)=0 AND A(I)<>0 AND X<(C(I)/A(I)) AND C(I)>0 THEN
PRINT @61,"***";: FOR L=1 TO 3: R=RND(100): NEXT : PRINT @61,
" ";: GOTO 360
320 IF Y>0 AND Y<TY THEN IF E<5 OR E>126 OR F<0 OR F>43 THEN
FOR RX=42 TO 0 STEP -1: SET(E,RX): NEXT: GOTO 360
330 IF A(I)<>0 AND HH=1 THEN H=INT(X): IF B(I)=0 AND
H=INT(C(I)/A(I)) THEN FOR H=0 TO 42: SET(E,H): NEXT H:HH=0
340 IF Y<TY OR B(I)=0 THEN IF Y>0 AND A(I)<>0 THEN FOR RX=0
TO 43: SET(E,RX): NEXT: GOTO 360
350 IF C(I)<0 AND Y>0 AND A(I)<>0 THEN FOR RX=0 TO 43:
SET(E,RX): NEXT
360 NEXT X,I: GOTO 490
370 REM FOR MINIMIZATION AREA PLOTTING
380 FOR I=1 TO NE:HH=1: FOR X=SX TO TX STEP S:Y=999999:
IF B(I)<>0 THEN Y=-A(I)/B(I)*X+C(I)/B(I) :REM THIS IS THE
CONSTRAINT EQUATION
390 E=23+((X-SX)/(TX-SX))*93: F=40-((Y-SY)/(TY-SY))*37:
IF E>5 AND E<126 AND F>0 AND F<43 AND B(I)>0 AND C(I)>0
SET(E,F): FOR RX=F TO 43 : SET(E,RX): NEXT: GOTO 480
400 IF E>5 AND E<126 AND F>0 AND F<43 AND B(I)<>0 AND C(I)<0
THEN SET(E,F): FOR RX=F TO 0 STEP -1 : SET(E,RX): NEXT:
GOTO 480
410 IF B(I)=0 AND A(I)<>0 AND X<(C(I)/A(I)) AND C(I)>0 THEN
FOR RX=42 TO 0 STEP -1: SET(E,RX): NEXT: GOTO 480
420 IF B(I)=0 AND A(I)<>0 AND X>(C(I)/A(I)) AND C(I)<0 THEN
FOR RX=42 TO 0 STEP -1: SET(E,RX): NEXT: GOTO 480
430 IF Y>0 AND Y<TY THEN IF E<5 OR E>126 OR F<0 OR F>43 THEN
PRINT @61,"***";: FOR L=1 TO 3:R=RND(100): NEXT L: PRINT @61,
" ";: GOTO 480

```

```

440 IF Y>0 AND B(I)>0 AND C(I)>0 : FOR RX=43 TO 0 STEP -1:
SET(E,RX): NEXT: GOTO 480
450 IF Y<TY AND Y>0 AND B(I)<0 AND C(I)<0 : FOR RX=43 TO 0
STEP -1: SET(E,RX): NEXT: GOTO 480
460 IF Y<TY AND A(I)<0 AND B(I)<0 AND C(I)<0 : FOR RX=43 TO 0
STEP -1: SET(E,RX): NEXT: GOTO 480
470 IF Y>0 AND Y<TY AND B(I)<>0 THEN FOR RX = 0 TO 43:
SET(E,RX): NEXT
480 NEXT X,I
490 IF P$<>"Y" THEN 160
500 LPRINT " "
510 LPRINT "TITLE: ";T$:LPRINT "DATE: ";D$
520 FF$="MAXIMIZATION": IF M%=2 THEN FF$="MINIMIZATION"
530 LPRINT FF$: LPRINT " ": LPRINT " THE OBJECTIVE FUNCTION
IS ";A;" * X1 + ";B;" * X2 "
540 LPRINT " THE CONSTRAINTS ARE ": FOR I=1 TO NE: LPRINT
" ";A(I);" * X1 + ";B(I);" * X2 ";FZ$;" ";C(I): NEXT I:
SP=2: IF CL=6 THEN SP=1
550 E$="###.###.###": FOR I=3 TO 43 STEP SP: J=42-I:
IF I<43 THEN LPRINT USING E$;(SY+J*(TY-SY)/39);:
560 FOR X=0 TO 100 STEP 1.6: REM CHANGE 100 TO 127 ON LINE
PRINTER II
570 IF POINT(X,I) THEN LPRINT "*";ELSE LPRINT " ";
580 NEXT X: LPRINT " ": NEXT I
590 FOR I=0 TO 6:G(I+1)=SX+I*(TX-SX)/5: NEXT
600 E$="###.###.### ###.###.### ###.###.###
###.###.### ###.###.### ###.###.###": LPRINT USING E$;
G(1),G(2),G(3),G(4),G(5): GOTO 160 :REM ADD G(6) FOR LINE
PRINTER I
610 PRINT "SIMPLEX SOLUTIONS TO LINEAR PROGRAMMING PROBLEMS"
620 PRINT "FOR MAXIMIZATION ALL CONSTRAINTS ASSUMED TO BE
A*X1 + B*X2 <=Z"
630 PRINT "FOR MINIMIZATION ALL CONSTRAINTS ASSUMED TO BE
A*X1 + B*X2 >=Z"
640 PRINT "THE NON-NEGATIVITY CONSTRAINTS FOR ALL VARIABLES
ASSUMED"
650 INPUT " 1 MAXIMIZATION OR 2 MINIMIZATION ";M%: IF M%<1 OR
M%>2 THEN 650
660 FZ$=">=": IF M%=1 THEN FZ$="<="
670 GOTO 60
680 CLS: PRINT "ACTION MENU": PRINT " G NEW GRAPH":
PRINT " R RECYCLE": PRINT " S SIMPLEX
SOLUTION"
690 INPUT "SELECTION ";SS$: CLS: IF SS$="S" THEN 730
700 IF SS$="R" THEN 20
710 IF SS$="G" THEN 70
720 GOTO 680
730 V%=2
740 R%=C%+1
750 CC%=V%+C%+1
760 IF M%=2 THEN R%=V%+1
770 X1(1)=A:X1(2)=B
780 IF M%=2 THEN 860
790 FOR J=1 TO V%
800 X(C%+1,J)=-X1(J)
810 NEXT
820 FOR J=V%+1 TO V%+C%+1
830 X(C%+1,J)=0
840 NEXT
850 GOTO 900
860 FOR I=1 TO V%
870 X(I,V%+C%+1)=X1(I)

```



```

880 NEXT I
890 X(V%+1,V%+C%+1)=0
900 FOR I=1 TO C%
910 X1(1)=A(I):X1(2)=B(I):X1(3)=C(I)
920 IF M%=1 THEN 980
930 FOR K=1 TO V%
940 X(K,I)=X1(K)
950 NEXT K
960 X(V%+1,I)=-X1(V%+1)
970 GOTO 1020
980 FOR K=1 TO V%
990 X(I,K)=X1(K)
1000 NEXT K
1010 X(I,CC%)=X1(V%+1)
1020 NEXT I
1030 FOR I=1 TO R%-1
1040 IF M%=2 THEN 1090
1050 FOR K=V%+1 TO CC%-1
1060 IF I=K-V% THEN LETX(I,K)=1
1070 NEXT K
1080 GOTO 1120
1090 FOR K=C%+1 TO CC%-1
1100 IF I=K-C% THEN LET X(I,K)=1
1110 NEXT K
1120 NEXT I
1130 IF P$="Y" THEN P$="H" ELSE P$="C".
1140 IF M%=1 THEN 1250
1150 FOR J=1 TO C%
1160 CL$(J)="S"+CHR$(J+48)
1170 NEXT J
1180 FOR J=C%+1 TO C%+V%+1
1190 CL$(J)="X"+CHR$(J-C%+48)
1200 NEXT J
1210 FOR I=1 TO R%-1
1220 RL$(I)="X"+CHR$(I+48)
1230 NEXT I
1240 GOTO 1580
1250 FOR J=1 TO V%
1260 CL$(J)="X"+CHR$(J+48)
1270 NEXT J
1280 FOR J=V%+1 TO CC%-1
1290 CL$(J)="S"+CHR$(J-V%+48)
1300 NEXT J
1310 FOR I=1 TO R%-1
1320 RL$(I)="S"+CHR$(I+48)
1330 NEXT I
1340 GOTO 1580
1350 CL$(0)=" ":RL$(R%)=" "
1360 ZP$="###.## "
1370 AP$=" % % "
1380 FOR J=0 TO CC%-1
1390 PRINT USING AP$;CL$(J);: IF P$="H" LPRINT USING AP$;
CL$(J);
1400 NEXT J: PRINT: IF P$="H" THEN LPRINT " "
1410 FOR I=1 TO R%:REM PRINT RESULTS SUBROUTINE
1420 FOR J=1 TO CC%
1430 IF J=1 THEN PRINT USING AP$;RL$(I);: IF P$="H" THEN
LPRINT USING AP$;RL$(I);
1440 PRINT USING ZP$;X(I,J);
1450 IF P$="H" THEN LPRINT USING ZP$; X(I,J);
1460 NEXT J
1470 PRINT

```

```

1480 IF P$="H" THEN LPRINT " "
1490 NEXT I
1500 IF M%=2 THEN 1540
1510 FOR I=1 TO R%: IF LEFT$(RL$(I),1)="X" THEN PRINT
RL$(I),"=";X(I,CC%): IF P$="H" THEN LPRINT RL$(I),"=";
X(I,CC%)
1520 NEXT I: PRINT "IF AN X DOES NOT APPEAR IT IS ZERO":
IF P$="H" THEN LPRINT "IF AN X DOES NOT APPEAR IT IS ZERO"
1530 GOTO 1560
1540 FOR I=NE+1 TO CC%-1: PRINT CL$(I),"=";X(R%,I): IF P$="H"
THEN LPRINT CL$(I),"=";X(R%,I)
1550 NEXT I
1560 PRINT "VALUE OF OBJECTIVE FUNCTION ";X(R%,CC%): IF
P$="H" THEN LPRINT "VALUE OF OBJECTIVE FUNCTION ";X(R%,CC%)
1570 RETURN
1580 REM START OF ANALYSIS
1590 REM NEGATIVE INDICATOR?
1600 N=0
1610 FOR J=1 TO CC%-1
1620 IF X(R%,J)<0 THEN LET N=1:JJ=J: GOTO 1660 :REM JJ IS
PIVOTAL COLUMN
1630 NEXT J
1640 PRINT "OPTIMAL SOLUTION ": IF P$="H" THEN LPRINT
"OPTIMAL SOLUTION"
1650 GOSUB 1350 : INPUT "ENTER TO RECYCLE FROM START";DD$:
GOTO 10
1660 M=9999999:REM SELECTING ROW
1670 FOR I=1 TO R%-1
1680 IF X(I,JJ)=0 THEN X1(I)=999999999: GOTO 1700
1690 X1(I)=X(I,CC%)/X(I,JJ)
1700 IF X(I,JJ)<=0 THEN 1720
1710 IF X1(I)<M THEN M=X1(I):II=I:REM PIVOTAL ROW
1720 NEXT I
1730 PV=X(II,JJ)
1740 FOR J=1 TO CC%:REM DIVIDE ITH ROW OLD BY PIVOT
1750 X(II,J)=X(II,J)/PV
1760 NEXT J
1770 RL$(II)=CL$(JJ):REM RELABEL ROW
1780 FOR I=1 TO R%
1790 IF I=II THEN NEXT I: GOTO 1580
1800 A=X(I,JJ)
1810 FOR J=1 TO CC%
1820 X(I,J)=X(I,J)-A*X(II,J)
1830 NEXT J,I
1840 GOTO 1580

```

Summary

This program solves the two-dimensional simplex-type linear programming problem both visually and analytically. The graphics allow the user to see the area where a feasible solution exists and how it is identified. The simplex solution procedure attached to the graphic analysis yields an algebraic solution.

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University of South Alabama
Mobile, Alabama 36688

Leo M. Conrad
Imagineering Concepts
P.O. Box 9843
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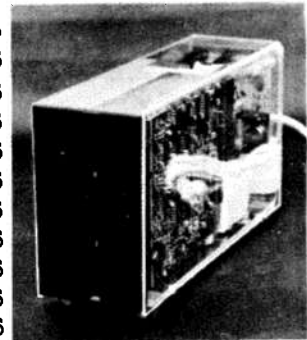
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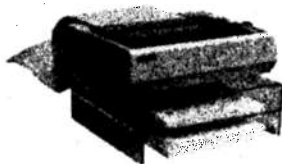
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POCKET COMPUTER CORNER

Steven M. Zimmerman, Ph. D. and Leo M. Conrad

Ratios for the Real Estate Investor

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The selection of ratios produced by our program are very popular among real estate investors. Included in the selection are:

1. Gross Rent Multiplier
2. Capitalization Ratio
3. Cash on Cash, return on investment (equity), ROI
4. Debt coverage ratio

We will detail how each of the ratios are calculated and some of the thinking processes used in applying them to investments. As with all tools, it is up to the investor to decide how best to use them for himself in his particular situation.

RATIOS CALCULATION METHODS

The Gross Rent Multiplier is the ratio of the investment divided by the gross rent income. This is a very useful fast method to tell if an investment is earning enough to justify a given price. In times of consistent financing and predictable business conditions, the gross rent multiplier can be a useful first cut tool. In times of innovative financing and unstable business conditions, the gross rent multiplier can be difficult to use.

Cap rates, or capitalization rates have been popular for both real estate investment and appraisal. The assumption when using cap rates is the investment (total investment including mortgages) should earn some value for many years, as if it were money placed in a bank forever. The calculation method consists of dividing the net yearly income (Gross income less expenses) by the total investment. No mortgage payments are taken into consideration.

CASH on CASH, return on investment, return on equity, or ROI may be calculated by dividing the cash flow per year, (Gross less expenses, less mortgage payments) by the cash investment. This method assumes a steady yearly cash earnings which is never true if after tax income is being considered.

Debt Coverage is simply the ratio of the mortgage to the overall investment. It tells the investor how much investor capital is needed as a ratio of the overall the investment. The lender will often specify the maximum coverage percentage which is acceptable from the lender's point of view.

CALCULATION OF THE FACTORS OF A MORTGAGE

To make the task of using the program a little easier, we have included the ability to calculate any one of the four factors of a mortgage. The method used to calculate each factor is detailed in Table 1 (see next column).

The only method that needs some explanation is that for finding interest per month. This task is usually a gross

Loan - principal	$P = R * ((1+i)^N - 1) / (i * (1+i)^N)$
Payment	$R = P * i * (1+i)^N / ((1+i)^N - 1)$
Months	$N = \text{LN} (1 / (1 - (i * P / R))) / \text{LN} (1 + i)$
interest	A five step approximation- where a series of five straight lines are fitted to the equation to find interest per period.

Where i=interest per month, N=number of months, R=the payment per month, and P is the loan or principal.

Table 1: Factors of a Mortgage Calculation Method

search task or an approximation task such as we have developed here. There is no direct method available.

The approach we have used consists of finding two points on the interest function, at 25%/12 and 75%/12 interest per month. A straight line is fitted to these two points, and the point where the straight line crosses the X axis is calculated. Then a small amount is added and subtracted to the value of X at this point, and the process is repeated. Each time the process is repeated the interval is reduced.

USING THE PROGRAM

The main menu of this program may be called by typing R. in either the RUN or DEFInable modes.

MORTG RATIOS?

You select the choice you want by typing the entire word as shown. The reason the MORTG option was included in this program is that, in our experience, the investor often is missing some information about the mortgage. This option allows you to solve for any missing information.

If you type MORTG and hit ENTER the next thing you will see is:

1-YR 2-LO 3-PAY 4-%?

The option in this menu must be selected by its number. 1 means you want to solve for the number of years, 2 for the value of the loan, 3 for the monthly payment, and 4 for the annual percentage rate of the loan. Assume for our example you know the payments are \$180.03 per month, the loan's value is \$15,000 and that there is 15 years left on mortgage. Type 4 to select the annual percentage rate option and then answer the next three questions with the data just given. The results will be:

PRIN: 15000.
PAY: 180.03
11.99026322%
15. YEARS



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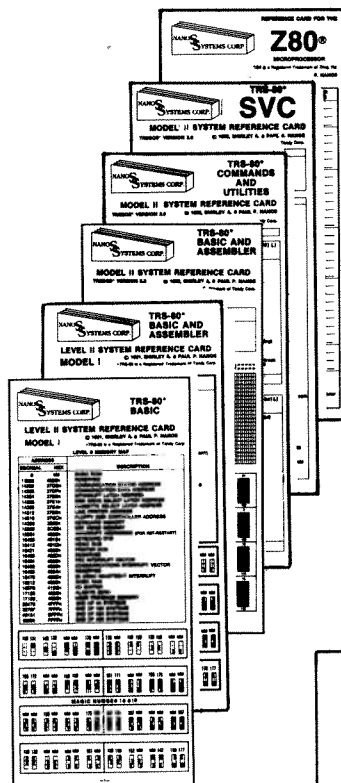
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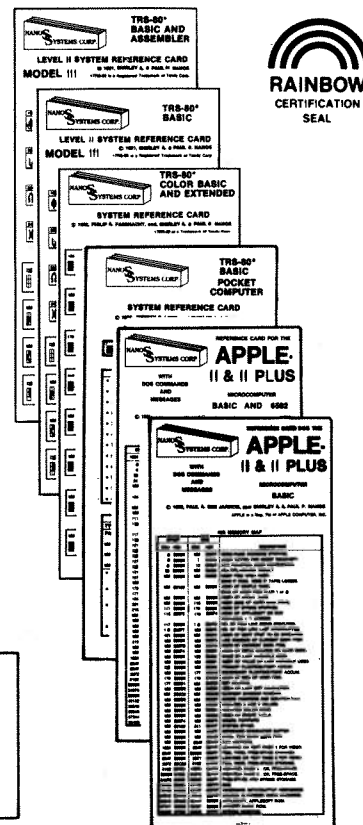
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When the program has finished printing on the printer or on the display (followed by an ENTER after each line) you will be returned to the main menu. This time select the RATIOS option and you will be asked the following question:

GROSS RENT?

Assume the gross rent is \$200 per month or \$2400 per year. Type 2400 and hit ENTER. The next question will be:

INVESTMENT?

Assume the investment is \$25,000 including the mortgage. Type 25000 and hit ENTER. The next question is relative to annual expenses:

EXPENSES?

In this case assume expenses are equal to \$2,150 per year. Type 2150 and hit ENTER.

The next question is relative to the mortgage. Assume the mortgage is the same as reviewed above. If this is true, all you need to do is hit the ENTER key at this point. The results should be:

GROSS RENT MULTI
10.4166667

CAP RATE
0.01

CASH/CASH
-0.191036

DEBT COVERAGE
0.6

GROSS RENT: 2400.
INVESTMENT: 25000

EXPENSES: 2150.

PRIN: 15000.

PAY: 180.03

11.99026322%

15. YEARS

You may wonder why the CASH/CASH is a negative number. If you calculate the gross income (2400) less expenses (2150) less 12 times the mortgage payment (180.03), you get -1910.36, a negative number, the ratio must therefore be a negative number.

EXAMINING THE PROGRAM

The first three lines of the program are the main menu. In line 1 the selection is made, and if MORTG is selected the program is routed to line 50. In line 2 the program is routed to line 10 if RATIOS is selected. In line 3 the program is returned to line 1 if an unacceptable selection is made.

Line 10 inputs all the information needed by the program to calculate the ratios except debt information. Line 11 is designed to input mortgage information. If you have already calculated the mortgage in the alternative routine, you need only answer with the ENTER key to skip the entire line.

Lines 12 through 15 print the ratios of interest, calculate their values, and prints the results. Line 16 prints the input information for the record. This line should be left out if you are not using a printer to aid in speeding the output process.

Lines 40 through 47 are a series of four subroutines which do all the calculations for the interest calculations. Line 40 is to find the present value of the loan. Line 42 is to find the payments. Line 43 is to find the life while lines 44 through 47 are used to find the annual percentage rate.

In line 50 the menu for the mortgage is found. Lines 51 through 54 input information available, while lines 55 through 58 call the subroutine needed.

The printing for all mortgage information is performed in line 59. This statement is used for both parts of the program. You may not wish to direct the program to this statement when calculating ratios if you are not using a printer.

PROGRAM LISTING

```

1: INPUT "MORTG RATIOS?"; A$: IF A$="MORTG" THEN 50
2: IF A$="RATIOS" THEN 10
3: GOTO 1
10: INPUT "GROSS RENT?"; G: INPUT "INVESTMENT?"; D: INPUT
    "EXPENSES?"; E
11: INPUT "MORTGAGE?"; P: INPUT "LIFE?"; N: N=12N: INPUT "APR?"; I
    : I=.01I/12: GOSUB 41
12: PRINT "GROSS RENT MULTI": PRINT D/G
13: PRINT "CAP RATE": PRINT (G-E)/D
14: PRINT "CASH/CASH": PRINT (G-E-12R)/(D-P)
15: PRINT "DEBT COVERAGE": PRINT P/D
16: PRINT "GROSS RENT: "; G: PRINT "INVESTMENT: "; D: PRINT
    "EXPENSES: "; E: GOTO 59
40: P=R*((1+I)^N-1)/(I*(1+I)^N): RETURN
41: R=P*I*(1+I)^N/((1+I)^N-1): RETURN
42: N=LN(1/(1-(IP/R)))/LN(1+I): RETURN
43: B=.25/12: T=.75/12: FOR U=1 TO 5: C=B
    : D=R-P*C*(1+C)^N/((1+C)^N-1)
44: E=T: F=R-P*E*(1+E)^N/((1+E)^N-1)
45: A=(D-F)/(C-E): B=D-A*C: I=-B/A: G=P*I*(1+I)^N/((1+I)^N-1)
    : T=I+.2/U^4: B=I-.2/U^4
46: IF B<0 LET B=.001
47: NEXT U: RETURN
50: INPUT "1-YR 2-LO 3-PAY 4-%?"; A
51: IF A<>1 INPUT "LIFE?"; N: N=12N
52: IF A<>2 INPUT "PRINT?"; P
53: IF A<>3 INPUT "PAY?"; R
54: IF A<>4 INPUT "APR?"; I: I=.01I/12
55: IF A=3 GOSUB 41
56: IF A=2 GOSUB 40
57: IF A=1 GOSUB 42
58: IF A=4 GOSUB 43
59: PRINT "PRIN: "; P: PRINT "PAY: "; R: PRINT 1200I;"%":
    PRINT N/12;" YEARS"
60: GOTO 1

```

SUMMARY

This program is written for the investor interested in real estate ratios to aid in making investment decisions. These ratios should not be used by themselves, but in conjunction with other evaluation techniques they can be of value.

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COLOR COMPUTER CORNER

continued from page 24

case modifications available which convert the Color Computer from reverse video to normal lower case (with descenders). They are not expensive. Why couldn't Radio Shack include a decent lower case on its machine? Remember, RS did the same thing with the Model 1. I can't say why. With a floppy disk and a printer, the Color Computer becomes a useful (and inexpensive) word processor. With programs like SPECTACULATOR, home finance control, inventory control, etc., the Color Computer becomes a very inexpensive yet versatile system. Unfortunately, since Radio Shack has decided (to the best of my knowledge) not to produce a full scale Expansion Unit, the potential power and usefulness of the Color Computer will remain limited. Considering the power of the 6809 processor, this is sad fact. It wouldn't surprise me if some independent company decided to produce an Expansion unit that would elevate the Color Computer to the scale of

ARRAY OF HOPE FOR BASIC PROGRAMMERS

continued from page 22

Hash code arrays also have some disadvantages which may not be obvious from the above examples. One of these is that, as for the direct lookup, duplicate keys cannot easily be accommodated. Duplicate keys will, of course, result in a clash, and the duplicate could be stored in the overflow portion. This would necessitate a search in the overflow portion each time, and thus the method would be most appropriate with a linked array. With duplicate keys the speed advantages of hash code arrays are reduced. The second disadvantage is that the array cannot easily be accessed in key sequence. This may not be necessary or only used sparingly, and in these cases the array could be sorted when the key sequence traversal is required. In most cases the advantages probably outweigh the disadvantages, and hash code arrays, like direct lookup arrays, should probably be used more extensively than at present.

Arne Rohde
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7600 Struer, Denmark ■

THE CARDWRITER

Anthony T. Scarpelli

This article is about a program that is not really needed. The program writes postcards. Most people use postcards because they are handy and inexpensive. How much effort does it take to write a postcard, you ask? Not much, but when you have a lot of them to write, this program can be used to save a lot of time. This particular program is directed to those who like to send in postcards to TV stations.

I believe we all watch TV. There is a great variety of programs available for viewing, and we all have our opinions as to their worth. They run from the best to the worst, each depending upon our own personal view. And some of us like to write to the TV station to express those views. Often it is not necessary to write a long letter, and sometimes we don't even have the time to write such a letter. So that is where postcards come in and also this program.

What this program does is to prompt you for certain responses, and you answer with either a number or with text, whichever is required. It also allows for a four line comment. It then prints the information out onto the card along with your name and address, and finally prints out the address of the broadcasting station you are writing to. You can literally print out a multitude of cards in minutes with little effort on your part; you don't even have to look up the addresses of the TV stations, nor even your own.

Let's take a look at the program. Line 20 is our standard initializing line, and from lines 30 to 160 we set up all the string variables and arrays we will be using. Lines 30-50 are for our greeting, 60-110 are for our opinions, 120-150 are for the TV station addresses, and finally line 160 is for your own address. You'll notice here in line 160 that there is a bit of indenting on the second and third line of the address, but not on the first. This is because I TAB to the indentation during printing for the first line. This allows us to use one string variable; but many other methods can also be used if you don't like this one. You should also notice that in all the addresses there is a line feed (down arrow) between all the lines. You can put any addresses you want in these lines, and even expand on them. You might want to add to this list your local TV stations, for instance.

Line 180 asks if you need instructions in case this is your first time through or if you don't write cards very often. Between lines 200 and 490 we input all the information that will eventually be printed. Lines 210-220 are for the greeting, and lines 230-260 are for the subject. I use line feeds freely in many of my print statements, so that is why some of these lines have no line numbers. (Most of these comments I make is for those of you who are new to Basic.) Line 250 will print a string of hyphens so that when you enter a subject, you will not go over the number of characters desired for that line. A postcard will easily fit 50 characters in a line, so all printout has to be limited to that. Once you see a printout you'll know why you are limited to only 33 characters for the show title, and this seems to

be enough for most shows.

Lines 270 to 290 are for the date, and you will notice that line 290 says LINE INPUT. This is a disk basic statement that allows you to input commas and quotes which are normally delimiters in input statements. If you don't have disk basic, then delete "LINE", but you won't be able to use commas in your dates. Lines 300-320 are for the time, and lines 330-350 are for your opinion. You probably have noticed that in the prompts I have included the words that will lead into your response. This is to trigger your memory. It helps to know how it will be printed.

Lines 360 to 460 are for your comment, and need more explanation. Line 380 again prints a line of hyphens to limit your first line of comment; you are allowed four lines, but only the first one is limited to less than 50 characters. Line 390 initializes our comment variable and the count, and the next line sets up a loop that scans the keyboard for a keypress. It stays in that line until a key is pressed, then falls through to the next line as soon as you enter a character. The first thing we do is to print it, then check to see if it is an (ENTER), whose ASCII code is 13. Line 430 checks to see if the keypress was a line feed (down arrow), and if it was, will print 50 hyphens, and then increment our count. If the count becomes five we leave the comment section. If our keypress was a backspace, we want to remove the last character from our comment string, and that is what the rest of line 450 does. Finally line 460 adds our character to the comment string and returns for another keypress. One problem with this routine that might be annoying to you is that there is no cursor as you type in your comment. If this bothers you, you can program one in here with a variety of methods.

Lines 470 and 480 ask for the broadcasting company you will be sending the card to, and it allows for an extra address that hasn't been previously stored. This is taken care of in line 490. Of course you should not use commas in your address unless you have disk Basic.

Lines 500 to 540 produce a pause to allow you to set up your printer. It also allows you to start over in case you made a mistake along the way, or want to change your opinion. Lines 560 to 770 print the card. Line 560 and 570 are straightforward, and 580 gets the length of the subject string. We need to know how long it is because it will determine how many words will be printed on a line before going to the next line. We want to fill up the card as much as possible, but we also want to limit the lines to 50 characters. So in lines 590 to 620 we use the length to determine how many words of the phrase "which was aired" will be printed along on the same line as the subject string. We also set a flag count to be able to know later just how many words were used in the next printed line. That is, in lines 640 to 670, we have a similar process to fill up the line depending on what was printed before. All this is to make the card appear to have been typed by a human, and not a machine.

Lines 670 to 740 do the standard job of printing out the rest of the card. Line 750 and 760 allow you to turn the card over to print the address. And finally lines 780 and 790 allow you to start another card.

As is usual, even though the program is simple, a lot of work went into it to make a simple, time-consuming process, like cardwriting, into a simple, speeded up process. I hope that you can use it. I like it better than writing cards, myself. Now, if everyone used this faster process, maybe TV will change for the better because there will be more people writing in to let the station masters know that we care what is going on in the land of television.

```
10 REM -- TV RESPONSE CARD WRITER
20 CLEAR 500: DIM GR$(3), OP$(6), AD$(5)
30 GR$(1)="SIR:"
40 GR$(2)="SIRS:"
50 GR$(3)="MADAM:"
60 OP$(1)="EXCELLENT"
70 OP$(2)="QUITE GOOD"
80 OP$(3)="GOOD"
90 OP$(4)="ONLY FAIR"
100 OP$(5)="PRETTY BAD"
110 OP$(6)="TERRIBLE"
120 AD$(1)="ABC-TV
130 AVE. OF THE AMERICAS
NEW YORK NY 10019"
130 AD$(2)="NBC-TV
30 ROCKEFELLER CENTER
```

```
NEW YORK NY 10020"
140 AD$(3)="CBS-TV
524 W. 57TH ST.
NEW YORK NY 10019"
150 AD$(4)="PUBLIC BROADCASTING SERVICE
475 L-ENSANT PLAZA, SW
WASHINGTON DC 20024"
160 MA$="ANTHONY T. SCARPELLI
98 FOXCROFT DR.
SCARBOROUGH ME 04074"
170 CLS:PRINT"** UNIVERSAL CARD WRITER **"
180 PRINT:INPUT"DO YOU WANT INSTRUCTIONS (Y/N)";X$
190 IF X$="Y" THEN CLS:GOSUB 810
200 PRINT:PRINT"ENTER YOUR UNIVERSAL GREETING:"
210 PRINT"DEAR..."
1--SIR:
2--SIRS:
3--MADAM:"
220 INPUT GR
230 PRINT:PRINT"ENTER THE SUBJECT:"
240 PRINT"YOUR SHOW..."
250 PRINT" ";STRING$(33,"-")
260 INPUT SB$
270 PRINT:PRINT"ENTER THE DATE:"
280 PRINT"ON..."
290 LINE INPUT DT$
300 PRINT:PRINT"ENTER THE TIME:"
310 PRINT"AT..."
```

continued on page 50

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Assembly Language for Beginners (Part 9)

Joseph Rosenman

Since I KNOW that you dazzled all of your friends (not to mention yourselves) with last month's alphabet printing program, I will proceed with a description of different ways that the same task could be performed.

```
;
; Alphabet printing program 2 (reading from a table).
;
Label  Command Argument
      ORG      7000H
DISP   EQU     0033H ;Rom subroutine to display character.
CLR    EQU     01C9H ;ROM subroutine to clear the screen.
DOS    EQU     402DH ;Address to return to DOS.
;
PROG2  CALL    CLR      ;Clear the screen.
      LD      HL,TAB   ;Get the address of the letter table.
      LD      B,26     ;Number of letters in the alphabet.
;
LOOP   LD      A,(HL)  ;Get the current letter.
      CALL   DISP     ;Display it.
      INC    HL       ;Point to the next letter.
      DEC    B        ;One less letter to display.
;
;          ;also, set the status flags.
      JR     NZ,LOOP  ;If not zero, display next letter.
;
      JP     DOS
;
; Data area
;
TAB    DEFM    'ABCDEFGHJKLMNOPQRSTUVWXYZ'
      END     PROG2
```

```
7000  CD C9 01 21 13 70 06 1A 7E CD 33 00 23 05 20 F8
7010  C3 2D 40 41 42 43 44 45 46 47 48 49 4A 4B 4C 4D
7020  4E 4F 50 51 52 53 54 55 56 57 58 59 5A ... ..
7000  ...!.....3.#. ...@ABCDEFGHJKLMNOPQRSTUVWXYZ
```

As you can see, there is also a second "dump" starting at address 7000H, except that the second dump is in ASCII. Note that the table of the alphabet also appears intact in the dump. Are there any new instructions? No! Since I can't explain any new instructions, let's take a closer look at the memory image.

```
7000  CD C9 01  CALL 01C9H
7003  21 13 70  LD HL,7013H
7006  06 1A  LD B,1AH
7008  7E  LD A,(HL)
7009  CD 33 00  CALL 0033H
700C  23  INC HL
700D  05  DEC B
700E  20 F8  JR NZ,F9H (-7)
7010  C3 2D 40  JP 402DH
```

```
7013  41 42 43 44 'ABCD'
7017  45 46 47 48 'EFGH'
701B  49 4A 4B 4C 'IJKL'
```

```
701F  4D 4E 4F 50 'MNOP'
7023  51 52 53 54 'QRST'
7027  55 56 57 58 'UVWX'
702B  59 5A  'YZ'
```

Now why would a CALL 01C9H turn into a CD C9 01? Of course, the CD is the "CALL" portion. The number CDH is the machine code for a CALL instruction. This is always followed by the two byte address (there for, a CALL instruction is always three bytes long). Why does the address 01C9H turn into C9 01? The reason is all sixteen bit (2 byte) values are stored "backwards." The two bytes in a sixteen bit number are identified as the MSB for Most Significant Byte, and LSB for Least Significant Byte. In the address 01C9H the MSB is 01, and the LSB is C9H. Since two byte values are stored in reversed order (LSB then MSB), the number is stored as C9 01. Is this also true for other sixteen bit values? Yes. Note that:

the LD HL,7013 becomes: 23 13 70
and CALL 0033 becomes: CD 33 00.

Now let's learn about a new instruction: DJNZ.

```
;
; Alphabet printing program 3 (reading from a table).
;
Label  Command Argument
      ORG      7000H
DISP   EQU     0033H ;Rom subroutine to display character.
CLR    EQU     01C9H ;ROM subroutine to clear the screen.
DOS    EQU     402DH ;Address to return to DOS.
;
PROG3  CALL    CLR      ;Clear the screen.
      LD      HL,TAB   ;Get the address of the letter table.
      LD      B,26     ;Number of letters in the alphabet.
;
LOOP   LD      A,(HL)  ;Get the current letter.
      CALL   DISP     ;Display it.
      INC    HL       ;Point to the next letter.
      DJNZ   LOOP     ;DEC B, if not zero - repeat.
      JP     DOS
;
; Data area
;
TAB    DEFM    'ABCDEFGHJKLMNOPQRSTUVWXYZ'
      END     PROG3
```

```
7000  CD C9 01 21 12 70 06 1A 7E CD 33 00 23 10 F9 C3
7010  2D 40 41 42 43 44 45 46 47 48 49 4A 4B 4C 4D 4E
7020  4F 50 51 52 53 54 55 56 57 58 59 5A ... ..
```

The DJNZ is a special instruction, which exists only in the Z-80 instruction set (it isn't in the 8080 or 8085 instruction set). The DJNZ stands for "Decrement B and Jump if not zero." The Jump portion of this instruction is just like the JR (127 bytes back or 128 bytes forward). What is more, it only decrements the B register. If B

contains a zero AFTER the decrement, the jump falls through (to the next instruction). Otherwise, it jumps to the target address.

One new instruction deserves another! Greet the LDIR (Load Direct on Incrementing Register), PUSH, and POP. What will the program do? Fill the screen with all of the characters from 20H to BFH (the values from 80H to BFH are the TRS-80 graphics characters). The program should briefly pause in between each "screen fill."

```
5200 3E 20 21 00 3C 11 01 3C 01 00 04 77 ED B0 FE BF
5210 CA 2D 40 3C CD 1A 52 C3 02 52 F5 21 02 05 2B 7C
5220 B5 20 FB F1 C9 .....
```

Gasp and dismay! I'm supposed to understand THAT!? You bet. First, lets trace through two complete iterations (excluding the DELAY subroutine). These two "passes" will fill the screen with blanks, then with exclamations marks.

```
; Screen display of character set
```

```
ORG 5200H
VIDEO EQU 3C00H ;Start of Video RAM.
DELVAL EQU 0500H ;Delay value
DOS EQU 4020H ;DOS re-entry location.

;
PROG4 LD A,20H ;First character to save.
PROG4A LD HL,VIDEO ;First location in Video.
LD DE,VIDEO+1 ;Second location in Video.
LD BC,400H ;Size of Video RAM
LD (HL),A ;Save character in Video.
LDIR ;Fill rest of Video.
CP 0BFH ;Last character?
JP Z,DOS ;If done, exit.
INC A ;Next character.
CALL DELAY ;Brief Pause
JP PROG4A ;Repeat with next character.

;
DELAY PUSH AF ;Save A register.
LD HL,DELVAL ;Get delay value.
DEL1 DEC HL ;One less to count.
LD A,H ;Get MSB of count.
OR L ;Mash the MSB and LSB together.
JR NZ,DEL1 ;If both aren't 0, repeat.
POP AF ;Done, get A back.
RET

;
END PROG4
```

Program Trace

```
1 PC=5200 A=? BC=???? DE=???? HL=???? SP=7100 LD A,20H
2 PC=5202 A=20 BC=???? DE=???? HL=???? SP=7100 LD HL,3C00H
3 PC=5205 A=20 BC=???? DE=???? HL=3C00 SP=7100 LD DE,3C01H
4 PC=5208 A=20 BC=???? DE=3C01 HL=3C00 SP=7100 LD BC,400H
5 PC=520B A=20 BC=0400 DE=3C01 HL=3C00 SP=7100 LD (HL),A
6 PC=520C A=20 BC=0400 DE=3C01 HL=3C00 SP=7100 LDIR
7 PC=520E A=20 BC=0000 DE=4000 HL=3FFF SP=7100 CP 0BFH
8 PC=5210 A=20 BC=0000 DE=4000 HL=3FFF SP=7100 JR Z,04
9 PC=5212 A=20 BC=0000 DE=4000 HL=3FFF SP=7100 INC A
10 PC=5213 A=21 BC=0000 DE=4000 HL=3FFF SP=7100 CALL 5225
    <Delay routine>
11 PC=5216 A=21 BC=0000 DE=4000 HL=3FFF SP=7100 JP 5202
12 PC=5202 A=21 BC=0000 DE=4000 HL=3FFF SP=7100 LD HL,3C00H
13 PC=5205 A=21 BC=0000 DE=4000 HL=3C00 SP=7100 LD DE,3C01H
14 PC=5208 A=21 BC=0000 DE=3C01 HL=3C00 SP=7100 LD BC,400H
15 PC=520B A=21 BC=0400 DE=3C01 HL=3C00 SP=7100 LD (HL),A
16 PC=520C A=21 BC=0400 DE=3C01 HL=3C00 SP=7100 LDIR
17 PC=520E A=21 BC=0000 DE=4000 HL=3FFF SP=7100 CP 0BFH
18 PC=5210 A=21 BC=0000 DE=4000 HL=3FFF SP=7100 JR Z,04
19 PC=5212 A=21 BC=0000 DE=4000 HL=3FFF SP=7100 INC A
20 PC=5213 A=22 BC=0000 DE=4000 HL=3FFF SP=7100 CALL 5225
    <Delay routine>
21 PC=5216 A=22 BC=0000 DE=4000 HL=3FFF SP=7100 JP 5202
22 PC=5202 A=22 BC=0000 DE=4000 HL=3FFF SP=7100 LD HL,3C00H
    And so on...
```

continued on next page

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The numbers to the left are only for reference purposes. What follows is a description of what each statement is doing. Since this program uses the PC, SP, BC, DE, HL, and A registers, the trace includes each register. In addition, the assembly language instruction is shown on the right.

- 1) Get the first character to display (a blank) in A.
- 2) Get the first video location in HL (16 bit value).
- 3) Get the second video location in DE.
- 4) Get the size of VIDEO RAM in BC.
- 5) Put the character into the start of Video Ram (contents of HL)
- 6) Fill Video Ram with the Character.

What? One instruction can do that? Yes. The LDIR instruction uses the HL, DE, and BC registers all at once. Remember, LDIR stands for Load on Incrementing Register. How does it work? HL contains the Source address, DE contains the Destination address, and BC contains the count. The instruction causes the byte pointed to by HL to be moved into the address pointed to by DE. Then, HL and DE are incremented, and BC is decremented. If BC does not equal zero, the process is repeated. When BC equals 0, execution continues with the next instruction. So, let's say we wanted to copy 20 bytes from 6000H to 7000H. The action of LDIR would be:

```
6000 30 31 32 33 34 35 36 37 38 39 3A 3B 3C 3D 3E 3F
6010 40 41 42 43 .....
```

```
7000 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
7010 00 00 00 00 .....
```

HL	DE	BC
6000	7000	0014
6001	7001	0013
6002	7002	0012
6003	7003	0011
6004	7004	0010
6005	7005	000F
6006	7006	000E
6007	7007	000D
6008	7008	000C
6009	7009	000B
600A	700A	000A
600B	700B	0009
600C	700C	0008
600D	700D	0007
600E	700E	0006
600F	700F	0005
6010	7010	0004
6011	7011	0003
6012	7012	0002
6013	7013	0001
6014	7014	0000

This table contains the contents of the 3 registers involved in the LDIR instruction. The changes shown illustrate what happens during the execution of a SINGLE LDIR instruction.

```
6000 30 31 32 33 34 35 36 37 38 39 3A 3B 3C 3D 3E 3F
6010 40 41 42 43 .....
```

```
7000 30 31 32 33 34 35 36 37 38 39 3A 3B 3C 3D 3E 3F
7010 40 41 42 43 .....
```

Now what would happen if we loaded HL with 7000H, DE with 7001H, and BC with 14H? Well; LDIR would move from 7000H to 7001H, then from 7001H to 7002H, then from 7002H to 7003H, etc. So, memory would then contain:

```
7000 30 30 30 30 30 30 30 30 30 30 30 30 30 30 30 30
7010 30 30 30 30 .....
```

HL	DE	BC
7000	7001	0014
7001	7002	0013
7002	7003	0012
7003	7004	0011
7004	7005	0010

etc.

When used in this way, the LDIR can quickly "fill" a memory area with a specific byte. Whatever byte is in the address pointed to by HL at the start of execution will be copied into all of the addresses following (up to DE+BC). Pretty slick, isn't it? Anyway, back to our program trace.

- 7) Is the value in A the last character? (If so, set the zero flag).
- 8) If we are up to the last character, skip ahead to DONE.
- 9) Since we're not done, increment A so that it points to the next character.
- 10) Call the delay routine so that we can see what's on the screen.
- 11) Let's do it all again.
- 12) Get the first Video location.
- 13) And the second video location.
- 14) Count (size of video).
- 15) Save the current character in the first location.
- 16) Fill-er-up!
- 17) Are we done yet? (No).

And so on.

Now, it's time to examine the Delay routine. There are two new instructions in this subroutine: PUSH and POP. Both PUSH and POP make use of the SP register. SP stands for "Stack Pointer." It looks like it's time to discuss the mysterious "Stack." A stack is a special data structure used in computers. (A Data Structure is a "system" of dealing with information that is formally described, and highly consistent.) A stack is actually a table or list of variables. Generally, you can access (read to or write from) any variable in this list (also known as an array). In the case of a stack, you can only access one end of the list. Whenever you add something to the stack, it "Pushes" everything down. Since the first thing added to the stack is always at the bottom of the list, it is the last thing to be accessed when things are taken off of the stack. This data structure is also known as a LIFO — an acronym for "Last In/First Out." Adding something to a stack is known as "PUSHing," and taking something off of a stack is known as "POPping." All values that are PUSHed or POPed must be sixteen bits long. Any double register can be PUSHed or POPed (AF, BC, DE, HL, IX, IY) except the SP and the PC. Since the SP

contains the current address of the stack, it would make no sense to save the address of the stack IN the stack. In the case of the PC, it is pushed onto the stack every time a CALL instruction is executed, and popped off of the stack whenever a RET instruction is executed.

Where is the stack? It could be anywhere in free RAM. I haven't included the necessary instructions to create and restore stacks yet so that I could keep the programs as simple as possible. Generally, the DOS or BASIC will have reserved a Stack with at least 10 free bytes (enough for 5 PUSHES and/or CALLs). Does that mean a program with more than 5 CALLs can't run? Not necessarily. If the CALLs are all one right after the other (without any RETs in between), then it DOES mean that the program may not work. In the case of the above programs, the value of the SP is actually fictitious. Since we didn't actually set the value of the SP (and can't know what it is), I set it for an area of unused RAM (where we might very well have placed it).

I'm afraid that the description of the DELAY program will have to wait until next month. In the mean time, you might want to experiment with different delay values. Try a value like 5000H instead of 500H. For those daring souls, I will pose an exercise. Re-write the program so that it displays all of the characters in reverse order (starting with the graphic block BFH, and ending with a blank). The only hint I will offer is that you should use the LDDR instruction (Load on Decrementing Register). It works just like LDIR, except that HL and DE are decremented after each move. Good Luck!

Corrections

One final order of business. I just received my copy of Computronics with Assembly Language # 6. There are several mistakes in it that need correction (some my fault, some not). First, an excuse. I have been writing in 8080 assembly language recently, and I see that I confused Z-80 and 8080 mnemonics several times (the Z-80 is a super-set of the 8080 machine language). On page 54, I used the command MNEMONIC JNZ. This is the 8080 equivalent of the Z-80:

Label	Command	Argument
	JP	NZ, Address.

Also on this page, there is the mysterious LDPPP instruction! Don't ask me what it does, since I have no idea. It was supposed to be a LD. (Maybe it stands for "Load Direct on Positive Phase Processing?!") Anyway, there is no such instruction on the 8080, 8085, Z-80, or any other CPU I know of. Apologies to all concerned.

Joseph Rosenman
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48K Bytes Ram	yes	no
Floppy Disk Controller	sng/dbl	sng/dbl
Serial RS232 Port	yes	yes
24 x 80 Characters	yes	no
Upper and Lower Case	yes	yes
Reverse Video	yes	no
Keyboard	63 Key	53 Key
Numeric Key Pad	yes	yes
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PHONE BILL SORTING PROGRAM

Dan Keen and Dave Dischert

Some people are involved in many different things. Recently we met a man who owned seven small companies which he operated out of one office.

At the end of the month when the telephone bill arrived, each long distance call had to be checked to see which company that amount should be billed to. Each number had to be put in a separate column and then each list was totalled.

A log book could be kept, but this was a pain, and it would still require someone to go through it manually and tally all amounts for each company.

Since most of the long distance calls were to the same numbers each month, we created a program which allows him to set up company files and store the numbers that are frequently called by each company.

When the monthly bill comes in, the secretary simply goes down the list and enters each phone number and its date, time (number of minutes), and amount.

She can then review the list in the computer and check it for any typographical errors.

When it is satisfactory, the computer will sort the entries, printing out a list for each company, including the date, time, phone number, amount and grand total for that company.

A miscellaneous list is created and totalled to show all the numbers which appeared on the phone bill but which were not on file with any of the companies.

OVERVIEW

This program allows you to store all regularly called phone numbers into separate files, each file representing a particular business or use. Several files can be set up for different businesses, or perhaps two files can be created, one to represent business calls, the other for personal calls made from the same telephone.

HOW TO USE THE PROGRAM

The top of the screen will show all the current company files on the diskette which you have created. Below that the MAIN MENU will be displayed. The video display would look like this assuming there have been two files created so far, one for a campground business and the other for the owner's personal calls.

THE FOLLOWING FILES ARE ON THIS DISK:

1 CAMP
2 PERSONAL

<A>DD NUMBERS	<C> ADD COMPANY LIST
<S>EARCH/EDIT/DELETE FILE	<E>NTER PHONE BILL
<R>E RUN PHONE BILL	<K>ILL OLD BILL

An invisible option, <Q>uit is not displayed, but will respond if a "Q" is typed. This will cause the program to end and return you to BASIC READY.

<C> ADD COMPANY LIST

This is the very first option you must choose when you initially run the program. You are prompted with: ENTER COMPANY NAME (OR JUST HIT <ENTER> KEY TO QUIT)

If the name conflicts with one previously entered, it will indicate that there is a conflict and the program will not accept your input.

It will again prompt you with ENTER COMPANY, and you can keep going. When you are finished, simply hit the <ENTER> key in response to entering a name. The program allows up to 9 companies to be added. They do not have to be added all at once. This option can be selected any time you wish to add another company.

The computer will automatically take the company name you type in and make it equal a filename which is in the correct form that the computer requires to enable it to store that file on diskette. There must be eight characters. If you enter more than eight, only the first eight (starting from the left) will be used. If you enter less than eight, the remainder will have asterisks tacked onto it. An extension of /FIL representing "file" is concatenated. Do not use numbers or spaces when entering a company name. For example, let's say you typed in a company named REPAIR. The filename on the diskette will appear as REPAIR**/FIL.

<A>DD NUMBERS

All the company files currently in storage (created by using the <C> ADD COMPANY option) are displayed on the screen along with a number beside them (1, 2, 3, etc.). You are prompted with ENTER COMPANY NUMBER TO WORK ON. Type the corresponding number. As with many inputs in this program, only one keystroke is necessary (you don't have to hit <ENTER> after you type the number). This helps speed you through the program.

ENTER PHONE NUMBER (HIT <ENTER> TO QUIT). Type in a phone number. If you type in the area code here, then you will have to also type in the area codes when you enter each phone number on your monthly bill, or the computer will not find a match. So get in the habit of using area codes either all of the time, or none of the time. You could choose just to use area codes on numbers which do not have the same code as you.

You can continue to enter numbers. To quit, simply respond to the ENTER NUMBER prompt by hitting the <ENTER> key.

Enter phone numbers in the form of 609-886-1511, using hypens between number sections.

<S>EARCH/EDIT/DELETE FILES

Selecting this option results in another menu, EDIT MENU. Options are:

<D>ELETE A COMPANY NAME
<P>HONE NUMBER FILE (EDIT OR CHANGE INFORMATION IN A FILE)
<Q>UIT

If you choose the <D>ELETE: The company file names and consecutive numbers are displayed. ENTER COMPANY NUMBER YOU WANT TO DELETE OR <Q>UIT. In case you want to bail out and not erase anything, you can always hit the "Q". This whole program is loaded with these "Q"uit bail outs at critical points. Finally, you are quizzed ARE YOU SURE YOU WANT TO DELETE? (Y/N). Enter a Y for yes, N for no. Once erased, there is no way to recover any information in that company file.

If you choose the <P>HONE NUMBER EDIT: ENTER COMPANY NUMBER YOU WANT TO WORK ON. A list is displayed.

The top of the screen will show you instructions as to available selections at this time:

SELECT LETTER: <A>DVANCE, ACKUP, <E>DIT, <D>ELETE, <Q>UIT

Picture in your mind a long list of phone numbers. The TV screen is a window, allowing you to view one number at a time. To look ahead to the next number, hit the letter "A". To go back to the last number, "B". If you wish to delete the number currently displayed, "D". If you want to change the number, hit "E".

<E>NTER PHONE BILL

ENTER DATE, PHONE NUMBER, TIME, COST. Do not enter a dollar sign for COST, simply the amount. Just go down the entire phone bill, entering the information for each number. Entering Area Code is optional. When you are done, just hit <ENTER> when asked DATE.

NOW TO REVIEW THE LIST. DO YOU WANT TO VIEW LIST ON:

<P>RINTER

<V>IDEO

<S>KIP TO SORTING BILL (Note item number to edit if needed.)

At this time you may wish to look over the numbers you just typed in to see if you made any errors. If you choose P or V, the list is shown, then the screen displays:

HIT <ENTER> TO SORT, <Q>UIT, <E>DIT FILE

If all looks well, then just hit <ENTER> and the computer will begin to sort out the phone numbers to their respective companies. Choosing the <S>KIP TO SORT option as previously mentioned also brings you to this point.

If you choose <E>DIT, ENTER FILE NUMBER OF LINE TO EDIT OR ENTER A ZERO TO QUIT will be displayed. The four lines of information (that is, date, number, time, amount) are shown. Choose a number from 1 to 4 representing the line you wish to change. The old value will be shown and you will be asked to enter the new value.

SORT. The sort routine will now print out on the line printer each company name and all the phone numbers and costs associated with that company. If there are any numbers on the list you entered that are not on file, then they will be placed in under a MISCELLANEOUS heading and their cost totalled.

If there is more than one company file that contains the same phone number, the sorted list will bill that phone number to the first company it encounters. For example, if

company file number 1 and number 3 both contain the number 123-1234, then number 1 will get the bill attributed to company 1.

A phone bill file is created, saving all these numbers and information you just entered. You can get another printout any time you wish by selecting the <R>ERUN PHONE BILL OPTION.

Before you <E>NTER another phone bill, you MUST use the <K>ILL OLD BILL option. This will erase the bill and clear the way for you to enter a new one. If you fail to do this, it is possible for phone numbers in last month's bill to be included erroneously into this month's bill. That would happen if last month's phone list was longer than this month's. So be sure to Kill before entering a new phone bill.

The <K>ILL option will prompt you with ARE YOU SURE? (Y/N). This gives you a chance to bail out at the last minute.

PROGRAM LISTING

10 REM

MODEL I & III VERSION

PHONE BILL PROGRAM

CREATED 08/06/81

UPDATED 11/08/81

```
20 CLS : CLEAR 15000 : DIM C$(50),F1$(250),PN$(250),MO$(12):
M$="#####.##" : M1$="##### " : M2$="### " : GOSUB 1000 :
GOSUB 1020
30 CLS : CLOSE : GOSUB 1030 : A$(0)="<A>DD NUMBERS" :
A$(1)="<C> ADD COMPANY LIST" : A$(2)="<S>EARCH/EDIT/DELETE
FILE" : A$(3)="<E>NTER PHONE BILL" : A$(4)="<R>E RUN PHONE
BILL" : A$(5)="<K>ILL OLD BILL" : C=0
40 FOR B=704 TO 959 STEP 32 : PRINT @B,A$(C) : C=C+1: NEXT :
C=0 : A=672 : IF D$( 1)="" THEN GOSUB 5100
50 A$=INKEY$: IF A$="A" THEN 100 ELSE IF A$="C" THEN 200 ELSE
IF A$="S" THEN 300 ELSE IF A$="E" THEN 500 ELSE IF A$="R"
THEN 600 ELSE IF A$="K" THEN 1300 ELSE IF A$="Q" THEN CLOSE :
END
60 A=A+32 : PRINT @A,STRING$(25," ") : FOR X=1 TO 50 : NEXT
: PRINT @A,A$(C) : C=C+1 : FOR X=1 TO 50 : NEXT : IF A$ <" "
THEN TM=0
70 IFC=6 THEN A=672 : C=0
80 TM=TM+1 : IF TM=500 THEN GOSUB850 : GOSUB 1030
90 GOTO 50
100 REM
```

ADD NUMBERS

```
110 CLS : PRINT TAB(23)"ADD PHONE NUMBERS" : PRINT
STRING$(64,"-") : GOSUB 1030 : GOSUB 1040
120 PH$="" : LINEINPUT"ENTER PHONE NUMBER (HIT <ENTER> TO
QUIT) ":PH$
130 IF PH$="" THEN CLOSE : RUN
140 FOR DE=1 TO LOF(2) : GET 2,DE : IF LEFT$(F1$,1)<"*" THEN
NEXT
150 RSET F1$=PH$ : PUT 2,DE : GOTO 120
200 REM
```

ADD COMPANIES

```
210 GOSUB 1010 : CLS
```

```

220 C0$="" : LINEINPUT"ENTER COMPANY NAME (HIT <ENTER> TO
QUIT) ";C0$
230 IF C0$="" THEN CLOSE : RUN
240 FOR DE=1 TO NF : IF LEFT$(C0$(DE),LEN(C0$))=C0$ THEN
PRINT"NAME CONFLICTS WITH AN EXISTING FILE " : GOTO 220 ELSE
NEXT
250 CN$=C0$+STRING$(10,"")
260 FI$=LEFT$(CN$,8)+"/FIL"
270 FOR DE=1 TO LOF(1) : IF LEFT$(F$(DE),1) <> "*" THEN NEXT
280 LSET F$(1)=C0$ : LSET F$(2)=FI$ : PUT 1,DE : NF=NF+1 :
C0$(NF)=F$(DE) : GOTO 220
300 REM

```

SEARCH EDIT

```

310 CLS : PRINT TAB(25)"EDIT FILES" : PRINT @256,"<D>ELETE
COMPANY NAME
<P>HONE NUMBER FILE EDIT
<Q>UIT" : GOSUB 900
320 IF IK$="P" THEN 400 ELSE IF IK$="Q" THEN 30 ELSE IF
IK$ <> "D" THEN 310
330 GOSUB 1030 : PRINT TAB(15)"ENTER COMPANY TO DELETE 'Q' TO
QUIT " : GOSUB 910 : IF IK$="Q" THEN CLOSE : GOTO 30 ELSE
GOSUB 1050 : IF IK=0 THEN 330
340 GOSUB 1010
350 PRINT"ARE YOU SURE YOU WANT TO DELETE THIS FILE? (Y/N) "
: GOSUB 900
360 IF IK$="Y" THEN KILL FI$ : C0$(IK)="*" : LSET
F$(0)=STRING$(42,"*") : PUT 1,C0$(IK) : CLOSE : RUN ELSE CLOSE
RUN
400 REM

```

EDIT PHONE NUMBERS

```

410 GOSUB 1030 : GOSUB 1040 : CLS
420 DE=1 : PRINT"SELECT A LETTER : <A>DVANCE, <B>ACKUP,
<E>DIT, <D>ELETE, <Q>UIT" : GOSUB 1060
430 GOSUB 910 : IF IK$="A" THEN GOSUB 440 ELSE IF IK$="B"
THEN 450 ELSE IF IK$="D" THEN GOSUB 490 ELSE IF IK$="E" THEN
GOSUB 480 ELSE IF IK$="Q" THEN CLOSE : GOTO 300 ELSE 430
440 IF DE>LOF(2) THEN 430 ELSE DE=DE+1 : GET 2,DE : GOSUB 460
: GOTO 430
450 IF DE<3 THEN 430 ELSE DE=DE-1 : GET 2,DE : GOSUB 460 :
GOTO 430
460 PRINT @160,CHR$(31) : PRINT @256,"PHONE NUMBER #";DE-1;"
":FI$ : RETURN
480 INPUT"ENTER NEW NUMBER ";NE$ : RSET F1$=NE$ : PUT 2,DE :
DE=DE-1 : RETURN
490 LSET F1$="** DELETE **" : PUT 2,DE : DE=DE-1 : RETURN
500 REM

```

ENTER PHONE BILL

```

510 X=0 : GOSUB 770 : CLS : PRINT"HIT <ENTER> FOR 'DATE' TO
QUIT" : PRINT STRING$(64,"")
520 PRINT @256,; : O$(0)="" : FOR DE=0TO3 : PRINT D$(DE+1),
: LINEINPU TO$(DE) : IF O$(0)="" THEN CLOSE : GOTO 600 ELSE
NEXT : X=X+1 : PRINT @256,;CHR$(31);
530 LSET F2$(0)=O$(0) : RSET F2$(1)=O$(1) : RSET F2$(2)=O$(2)
: LSET F2$(3)=MKS$(VAL(O$(3))) : PUT3,X : GOTO 520
600 REM

```

COMPUTES PHONE BILLS (SORT)

```
605 GOSUB 770
```

```
610 X1=0 : CLS : PRINT "NOW TO REVIEW THE LIST DO YOU WANT
TO VIEW LIST ON :
```

```
<P>RINTER
```

```
<V>IDEO
```

```
<S>KIP TO SORTING BILL
```

```
(NOTE THE ITEM NUMBER TO EDIT IF NEEDED)" :
```

```

GOSUB 910 ELSE CLOSE : GOTO 30
620 IF IK$="P" THEN GOSUB 690 : GOTO 635 ELSE IF IK$="S"
THEN 640 ELSE IF IK$ <> "V" THEN 610
630 GOSUB 1210 : FOR DE=1 TO LOF(3) : GET3,DE : GOSUB 1220 :
NEXT
635 Q$="" : PRINT"HIT <ENTER> TO SORT, <Q> TO QUIT, <E> TO
EDIT FILE" : GOSUB 910 : IF IK$="E" THEN 700 ELSE IF IK$="Q"
THEN CLOSE : GOTO 30 ELSE IF IK$=CHR$(13) THEN 640 ELSE
GOTO 635
640 CLS : PRINT"STANDBY. SORTING YOUR NUMBERS" : X=LOF(3) :
FOR DE=1 TO X : GET 3,DE : PN$(DE)=F2$(1) : NEXT
650 FOR DE=2 TO NF : FI$=RIGHT$(C0$(DE),12) : CLOSE 2 : GT=0
: LPRINT LEFT$(C0$(DE),30) : GOSUB 1110 : GOSUB 750
660 FOR DL=1 TO LOF(2) : GET 2,DL : F1$(DL)=F1$ : NEXT
670 FOR D=1 TO X : FOR D1=1 TO LOF(2) : IF LEN(F1$(D1))>1
THEN IF F1$(D1)=RIGHT$(PN$(D),LEN(F1$(D1))) THEN GET 3,D
: F2=CVS(F2$(3)) : LPRINT F2$(0),F2$(1),F2$(2),USING M$;F2
: PN$(D)=STRING$(12,32) : GT=GT+F2 : D1=0
680 NEXT D1,D : GOSUB 1270 : GT=0 : NEXT DE
685 LPRINT" " : LPRINT"MISCELLANEOUS NUMBERS" : LPRINT" " :
GOSUB 1110 : FOR DE=1 TO X : IF RIGHT$(PN$(DE),1)="" THEN
687 ELSE GET3,DE : F2=CVS(F2$(3)) : GT=GT+F2 : GOSUB 1260
687 NEXT : CLOSE : GOSUB 1270 : GOTO 30
690 GOSUB 1240 : FOR DE=1 TO LOF(3) : GET3,DE : GOSUB 1250 :
NEXT : GOTO635
700 REM

```

EDIT BILL FILE

```

710 INPUT"ENTER FILE NUMBER TO EDIT 0 TO QUIT";Q : IF Q=0
THEN 635
720 GET 3,Q : GOSUB 1120 : PRINT : PRINT : PRINT"ENTER NUMBER
TO EDIT 0 TO QUIT" : GOSUB 910 : IK=VAL(IK$) : IF IK>4 THEN
720 ELSE IF IK=0 THEN 635
725 IK=IK-1 : PRINT D$(IK+1);" OLD VALUE IS ";F2$(IK) :
INPUT" ENTER NEW VALUE ";NV$ : IF IK=0 THEN LSET F2$(0)=NV$
ELSE IF IK=1 OR IK=2 THEN RSET F2$(IK)=NV$ ELSE IF IK=3 THEN
LSET F2$(3)=MKS$(VAL(NV$))
730 PUT 3,Q : GOSUB 1120 : PRINT"IS THIS CORRECT Y/N " :
GOSUB 910 : IF IK$="Y" THEN 710 ELSE GOTO 720
740 REM

```

OPEN COMPANY PHONE LIST FILE

```

750 OPEN"R",2,FI$ : FIELD 2,12ASFI$ : RETURN
760 REM OPEN FILE FOR BILL
770 OPEN"R",3,"PHONE/BIL" : FIELD 3,5 AS F2$(0),12 AS F2$(1),
3 AS F2$(2),4 AS F2$(3) : RETURN
800 REM

```

ENTER COMPANY NAMES

```

810 CLS : C0$="" : PRINT @320,; : INPUT"ENTER COMPANY NAME
(HIT <ENTER> IF DONE) ";C0$ : IF LEN(C0$)<8 THEN
CN$=C0$+STRING$(10,"*")

```

continued on page 53

SOFTWARE REVIEWS

Super Utility Plus by Kim Watt

Joseph Rosenman

There are many utility programs for the Models 1 and 3. Quite a few of them are useful, quality programs. Even in this crowded market, Super Utility has made a well deserved name for itself. First, the facts:

Super Utility Plus
by Kim Watt
Breeze/QSD Inc.
11500 Stemmons Expwy., Suite 125
Dallas, Texas 75229

System: Model 1 or Model 3
RAM: 48K required
Disks: At least 1 disk required.
Language: Z-80 Machine Language.

Super Utility is a powerful and comprehensive disk access and modification utility. What is a disk utility? It is a program that permits the diskette to be analyzed, displayed, and altered. Many users of the the NEWDOS80 disk operating system (by Apparat) might be familiar with the SUPERZAP program. SUPERZAP is a disk utility that is included with NEWDOS80. I can say from a great deal of personal experience that Superzap is an extremely useful program. It has one distinct advantage over Super Utility: it is a CMD file. With that one exception, Super Utility is overflowing with extra features. I guess the best way to understand the scope of Super Utility is to examine the multiple Menus that it uses.

Main Menu

- | | |
|----------------|---------------------|
| 1) Disk Zap | 6) Tape Utilities |
| 2) Disk Purge | 7) Memory Utilities |
| 3) Disk Format | 8) File Utilities |
| 4) Disk Backup | 9) Configure System |
| 5) Disk Repair | 0) Exit Program |

Each menu selection in turn calls up another menu. The menu "topics" are arranged in a logical fashion, and pretty much cover the gamut of utility functions. The next step in describing Super Utility is to describe the sub-menu details.

1) Disk Zap

- 1) Display sectors: Display any disk sector in Hex and ASCII.
- 2) Verify sectors: Make sure the data in the sector is correct.
- 3) Compare sectors: Determine whether any two sectors match.
- 4) Copy sectors (on the same disk or on any two disks).
- 5) Copy sector Data: This copy is similar to Copy Sectors, but the size is specified as a byte count rather than a sector count.
- 6) Zero sectors.
- 7) Reverse sector data: Byte 256 becomes byte 1, byte 255 becomes byte 2, etc.
- 8) Exchange sectors (swap a specific number of sectors).

9) String search: will search the disk for any length ASCII string or byte list (replacement is optional).

- 0) Sector search: Search for duplicate sectors.
 - A) Read ID address marks: Display track ID information.
 - B) Alter data address marks.

Note that the Display Sector option also allows you to modify the sector contents, and write it back to the disk.

2) Disk Purge

- 1) Kill selected files
- 2) Kill by category: by extension or attribute.
- 3) Remove system files.
- 4) Remove all passwords.
- 5) Disk Directory: with all of the trimmings.
- 6) Zero unused entries: cleans up unallocated FPDEs.
- 7) Zero unused granules: fills all unused sectors with 00s.
- 8) Change disk name.
- 9) Change file parameters: a fancy RENAME function.
- 0) Check directory: verifies that there are no errors.

3) Disk Format

- 1) Standard Format
- 2) Special Format: Allows you to custom configure the formatting.
- 3) Format without erase: will "clean up" the inter-sector gaps.
- 4) Build Format track (in memory).
- 5) Write Format track (from memory).
- 6) Software bulk erase: Wipe out all information from the diskette.

4) Disk Backup

- 1) Standard Disk Backup.
- 2) Special Disk Backup: Analyze a disk, then duplicate.

5) Disk Repair

- 1) Repair GAT sector.
- 2) Repair HIT sector.
- 3) Repair BOOT sector.
- 4) Read protect directory (read protection is a quick way to locate the directory in the TRSDOS compatible DOSes).
- 5) Un-read protect directory.
- 6) Recover killed files (as long as it wasn't killed by TRSDOS).
- 7) Move Directory (to any unallocated track).
- 8) Display Directory.
- 9) Check directory (thorough directory test).
- 0) Clear unused entries: zero out all unused FPDEs.

6) Tape Utilities

- 1) Read Tape.
- 2) Write Tape.
- 3) Verify Tape.
- 4) Copy Tape.

7) Memory Utilities

- 1) Display memory.
- 2) Move memory.
- 3) Exchange memory.
- 4) Compare memory: byte by byte comparison.
- 5) Fill memory.
- 6) Reverse memory: First byte becomes last, etc.
- 7) Test memory: Tests a range of memory with every possible bit pattern.
- 8) Jump to memory: transfers execution to a memory location.
- 9) String search: Search memory for an ASCII string or byte pattern.
- 0) Input byte from port.
- A) Output byte to port.
- B) Memory to sectors: dump memory to disk sectors.
- C) Sectors to memory.
- D) Memory to track (entire track).
- E) Track to memory (reads all sectors and inter-sector gaps).

8) File utilities

- 1) Display file sectors.
- 2) Compare files.
- 3) Copy files: will copy a specified group of files all at once.
- 4) Disk Directory: provides a file oriented disk directory.
- 5) Free space: gives a summary of all space available on all drives.
- 6) Offset file: allows a file to be modified so that it will load at a different address.
- 7) File locations: provides a complete description of all files on a disk.
- 8) Drive status.
- 9) Sector allocation: Will determine what file is located at any given track and sector.
- 0) Build a file: pre-allocate a file on disk.
- A) Clear a file: zero out all data sectors on a file.
- B) Disk allocations: display allocation status for each track.
- C) Compute hash code (for any filename).
- D) Compute passwords: will encode or decode any password.

9) Configure System

Configuration can be "hard" or "soft." In "soft" configuration, the configuration table is altered. "Hard" configure requires that the Super Utility Plus disk program be zapped. This section of Super Utility is VERY VERY complicated. You can custom configure:

- 1) DOS type
- 2) "Real" track count
- 3) "Relative" track count
- 4) Directory location
- 5) Stepping rate
- 6) Initial drive delay
- 7) Software write protect
- 8) Disk density
- 9) Real track/relative track relationship
- 10) Track 0 density

- 11) Starting sector value
- 12) Data Address Mark (DAM)
- 13) Hi speed mod (Y/N)
- 14) Tie printer to display (Y/N)
- 15) Define high speed activate code
- 16) Define high speed deactivate code
- 17) Printer graphics (Y/N)
- 18) Lowercase (Y/N)
- 19) Epson MX-80 (Y/N)
- 20) Parallel (Y/N)
- 21) Line Feeds (Y/N)

0) Exit Super Utility

Super Utility doesn't require a system disk to be in drive 0 while it is running. When you are ready to exit Super Utility, you need to replace the system disk.

As you can see, Super Utility covers a very wide range of applications. What's more, it works! This is a very powerful and useful program. What would I suggest if Kim Watt asked me "How to improve Super Utility?"

- 1) Re-write the Configuration section so that it is clearer.
- 2) Permit configuration to be "hard" saved to disk without zapping.
- 3) Modify the "Special Copy" command so that "strange" information can be displayed/acted upon.
- 4) Permit the Special copy function to save the disk parameters and read them back.
- 5) Provide Super Utility as a CMD file (I know they won't, since CMD files are too easy to copy).
- 6) Use a larger print in the instructions.

By the way, the instructions are quite comprehensive. The program includes a 42 page instruction manual. What is more, there is a large section on particular systems (Model 1 or 3, NEWDOS80, DOSPLUS, LDOS, TRSDOS, etc.).

As you might have guessed by now, I believe that this is a very useful program. Since it greatly increases the power of your TRS-80, "no system should be without it." This is probably the best program of its type, and is well worth having.

Joseph Rosenman
35-91 161 Street
Flushing, NY 11358 ■

THE CARDWRITER

continued from page 41

```
320 LINE INPUT TM$
330 PRINT:PRINT"ENTER YOUR OPINION:"
340 PRINT"WAS REALLY..."
    1--EXCELLENT
    2--QUITE GOOD
    3--GOOD
    4--ONLY FAIR
    5--PRETTY BAD
    6--TERRIBLE"
350 INPUT OP
360 PRINT:PRINT"ENTER YOUR COMMENT,
    JUST <ENTER> IS NO COMMENT,
    TO ADD A LINE USE DOWN ARROW,
    4 LINES MAXIMUM:"
```

continued on page 52

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THE CARDWRITER

continued from page 50

```
370 PRINT"I THINK THAT..."
380 PRINT STRING$(36,"-")
390 CM$="":C=1
400 AS=INKEY$:IF AS="" THEN 400
410 PRINTAS;
420 IF AS=CHR$(13) GOTO 470
430 IF AS=CHR$(10) THEN PRINT STRING$(50,"-"):C=C+1
440 IF C=5 GOTO 470
450 IF AS=CHR$(8) CM$=LEFT$(CM$, (LEN(CM$)-1)):GOTO 400
460 CM$=CM$+AS:GOTO 400
470 PRINT:PRINT"WHO IS THIS TO BE ADDRESSED TO:
1--ABC
2--CBS
3--NBC
4--PBS
5--OTHER"
480 INPUT AD
490 IF AD=5 THEN LINE INPUT"SPECIFY NAME AND ADDRESS
USE DOWN ARROW FOR EACH LINE:
";AD$(5)
500 PRINT:PRINT"PREPARE PRINTER AND CARD"
510 INPUT"ENTER <P> TO PRINT,
ENTER <S> TO START AGAIN";X$
520 IF X$="S" THEN RUN
530 IF X$="P" THEN 550
540 GOTO 510
550 PRINT
560 LPRINT"DEAR ";GR$(GR)
570 LPRINT" YOUR SHOW, ";CHR$(34);SB$;CHR$(34);",";
580 LN=LEN(SB$)
590 IF LN>27 THEN LPRINT:LPRINT"WHICH WAS AIRED ";:F=3:GOTO 630
600 IF LN>23 AND LN<28 LPRINT" WHICH":LPRINT"WAS AIRED ";:
F=2:GOTO 630
610 IF LN>17 AND LN<24 LPRINT" WHICH WAS":LPRINT"AIRED ";:
F=1:GOTO 630
620 LPRINT" WHICH WAS AIRED"
630 LPRINT"ON ";DT$;" AT ";TM$;
640 IF F=1 LPRINT", I FOUND TO BE":LPRINT"REALLY ";:GOTO 680
650 IF F=2 LPRINT", I FOUND TO":LPRINT"BE REALLY ";:GOTO 680
660 IF F=3 LPRINT", I":LPRINT"FOUND TO BE REALLY ";:GOTO 680
670 LPRINT", I FOUND TO BE REALLY"
680 LPRINT OP$(OP);" "
690 IF CM$=""THEN 710
700 LPRINT"I THINK THAT ";CM$;". "
710 IF OP>3 THEN LPRINT"BETTER LUCK ON FUTURE SHOWS."
720 IF OP<4 THEN LPRINT"KEEP UP THE GOOD WORK."
730 LPRINT TAB(14)"SINCERELY,"
740 LPRINT TAB(18) M$
750 PRINT:PRINT"TURN CARD OVER AND POSITION FOR ADDRESS."
760 INPUT"PRESS <ENTER> WHEN READY";X
770 LPRINT AD$(AD)
780 PRINT:INPUT"DO ANOTHER CARD (Y/N)";X$
790 IF X$="Y" THEN RUN
800 END
810 PRINT"THIS IS YOUR NEW AND PERSONAL TV RESPONDER SYSTEM.
WITH IT YOU CAN NOW VERY EASILY COMMENT ON ALL THOSE TV
SHOWS THAT YOU LOVE OR HATE. RUN IT, AND IT WILL PROMPT YOU"
820 PRINT"WITH A NUMBER OF COMMONLY USED PHRASES AND ALL YOU
NEED TO DO IS RESPOND WITH EITHER A NUMBER OR THE REQUIRED
```

TEXT. YOU DON'T HAVE TO ADD PUNCTUATION AT THE END, THE PROGRAM DOES IT FOR YOU. WHEN YOU ARE PROMPTED TO INPUT A LONG" 830 PRINT"STRING OF CHARACTERS, A LINE WILL APPEAR OVER THE SPACE WHERE YOU WILL ENTER THE TEXT. JUST DON'T GO BEYOND THE END OF THE LINE AND YOUR COMMENTS WON'T AFFECT THE PROGRAM, AND IT WILL FIT NICELY ON A STANDARD POSTCARD."

840 PRINT"WHEN YOU ARE ENTERING YOUR COMMENT THERE WILL BE NO CURSOR, BUT ENTER TEXT AS USUAL, IT WILL BE PRINTED AND THE BACKSPACE WORKS. HAVE FUN."

850 INPUT"PRESS <ENTER> TO CONTINUE";X

860 RETURN

Anthony T. Scarpelli

98 Foxcroft Dr.

Scarborough ME 04074 ■

BEGINNER's CORNER

continued from page 14

Pathways Through the Rom: Guide to Level II Basic and DOS
source code

Softside Publications A compilation of several sources
by George Blank
John Hartford
John T. Phillipp
and Robert M. Richardson
P= 19.95 V= 25.00

EXAMPLE 4. GRAPHICS

TRS-80 Graphics for the Model I and Model III
Byte books R.S. Cat. No. 62-2087
by Kater and Thomas
P= 10.95 V= 13.00

Graphic Software for Microcomputers

Kern by Korites
P= 21.95 V= 25.00

(Written for Apple but easily converted to TRS-80)

EXAMPLE 5. GENERAL TECHNIQUES AND INFORMATION

Programming Design and Construction

Prentis-Hall by David Higgins
P= 12.95 V= 8.95

The Basic Conversions Handbook for the Apple, TRS-80 and Pet
Users

Hayden Brain Bank: David Brain
P. Oviato
P. Paquin
C. Stone
P= 7.95 V= 5.00 (on sale at a show)

Microcomputer Dictionary

Radio Shack R.S. Cat. No. 62-2311
by Charles J. Sippl
P= 7.95 V= 10.00

I won't go into the advanced texts, except to say that the books in the remaining example are all good. I tend to think of the Barden, Heiserman, Rosenfelder, and Gratzner books as a complete, AND I MEAN COMPLETE, set which contains just about every trick that Basic is capable of, within those covers.

The Pathways book is good too, because it contains reference material that I have not seen in other texts. It also has part of the "Disassembled Handbook" (sort of a disassembled "Disassembled Handbook") which has the easiest and clearest explanation of how to use those ever-present "ROM" routines.

The graphics texts are the best I've come across. Both belong on your shelf. If any better ones come along, I'll be sure to let you know. The Graphics for Micros book is excellent because of its clear explanations of the theory. Most of the programs are easily convertible for the TRS-80, especially if you can write a routine that will connect two points, such as Med Systems' GRBASIC.

The book's General Techniques are all useful. You can find them at your local book shop and decide for yourself which suit your need for the moment.

Well, that about covers them all. Should you come across them at good prices (try college book stores and computer shows), by all means buy them. There is bound to be some repetition of information, but I've found that when one book isn't clear on something, another usually is. That topic, however, is another story. So, until next time, good programming to you.

Spencer Koenig
153-27 73 Avenue
Flushing NY 11367
compuserve 71625,1637 ■

PHONE BILL SORTING PROGRAM

continued from page 48

```
820 IF C0$="" THEN CLOSE : RUN ELSE F1$=LEFT$(C0$,8)+"/FIL"
830 FOR DE=2TOL0F(1) : IF LEFT$(F$(0),1)<>"*" THEN NEXT
840 LSET F$(1)=C0$ : LSET F$(2)=F1$ : PUT1,DE : GOT0810
850 REM      TIMER FOR SCREEN
860 CLS : FOR X=1 TO 2000 : PRINT @C,RIGHT$(TIME$,8);: IF
INKEY$<>" " THEN 880 ELSE NEXT
870 C=C+8 : IF C>55 THEN C=0 : GOT0 860 ELSE GOT0 860
880 CLS : TM=0 : C=0 : A=672 : RETURN
900 REM      INKEY ROUTINE
910 IK$=INKEY$ : IF IK$="" THEN 910 ELSE RETURN
920 PRINT TAB(20)"HIT ENTER TO CONTINUE"; : GOSUB 910 : CLS
: X1=0 : RETURN
1000 REM      SET UP ARRAY OF COMPANY NAMES
1010 OPEN "R",1,"COMPANY/FIL" : FIELD 1,30ASF$(1),12ASF$(2) :
FIELD 1,42ASF$(0) : RETURN
1020 DL=0 : IF LOF(1)<2 THEN 800 ELSE FOR DE=2TOL0F(1) : GET
1,DE : IF LEFT$(F$(0),1)<>"*"ANDASC(LEFT$(F$(0),1))>32 THEN
DL=DL+1 : C0$(DL)=F$(0) : C0(DL)=DE : NEXT : NF=DL : RETURN
ELSE NEXT : NF=DL : RETURN
1030 CLS : PRINT"THE FOLLOWING FILES ARE ON THIS DISK : " :
PRINT STRING$(64,"="); : FOR DE=2TONF : PRINTDE-1;"
```

```
";LEFT$(C0$(DE),30) : NEXT : RETURN
1040 PRINT TAB(15)"ENTER COMPANY NUMBER TO WORK ON "; :
GOSUB 910 : IK=VAL(IK$) : IF IK<10RIK>NF-1 THEN 1040 ELSE
IK=IK+1 : F1$=RIGHT$(C0$(IK),12) : PRINT " ";LEFT$(C0$(IK),30)
: GOSUB 750 : RETURN
1050 IK=VAL(IK$) : IF IK<1 OR IK>NF-1 : IK=0 : RETURN ELSE
IK=IK+1 : F1$=RIGHT$(C0$(IK),12) : PRINT " ";
LEFT$(C0$(IK),30) : RETURN
1060 A$=" WORKING ON "+RIGHT$(C0$(IK),12)+" FILE " :
DL=64-LEN(A$) : A1=INT(DL/2) : A$=STRING$(A1,"=") +
A$+STRING$(32,"=") : A$=LEFT$(A$,64) : PRINT @64,A$ : RETURN
1100 REM      LINE PRINTER HEADINGS
1110 LPRINT "DATE","PHONE #","TIME (MIN)"," AMOUNT" :
LPRINT STRING$(60,"-") : RETURN
1120 CLS : PRINT : PRINT : PRINT : PRINT LI$;" 1 DATE";
TAB(25)F2$(0) : PRINT LI$;" 2 PHONE NUMBER";TAB(25)F2$(1) :
PRINT LI$;" 3 TIME";TAB(25)F2$(2) : PRINT LI$;" 4 COST";
TAB(25)USINGM$;CVS(F2$(3)) : RETURN
1200 REM      PRINT SUBROUTINE
1210 PRINT"ITEM # DATE","PHONE #","TIME"," COST" : RETURN
1220 PRINT USING M2$;DE; : PRINT " "; : PRINTF2$(0);" ";
F2$(1),F2$(2),USINGM$;CVS(F2$(3)) : X1=X1+1 : IF X1=>14 THEN
GOSUB 920 : RETURN ELSE RETURN
1230 REM      LPRINT SUBROUTINE
1240 LPRINT"ITEM #","DATE","PHONE #","TIME","COST" : RETURN
1250 LPRINT USINGM2$;DE; : LPRINT,F2$(0),F2$(1),F2$(2),USING
M$;CVS(F2$(3)) : RETURN
1260 LPRINT F2$(0),F2$(1),F2$(2),USING M$;F2 : RETURN
1270 LPRINT " " : LPRINT"THIS TOTAL =" ;USING M$;GT : LPRINT " "
: LPRINT " " : RETURN
1300 CLOSE : CLS : PRINT : PRINT : PRINT : PRINT"ARE YOU SURE
YOU WANT TO KILL OLD PHONE BILL Y/N " : GOSUB 910 : IF
IK$="Y" THEN KILL"PHONE/BIL" : GOT0 30 ELSE GOT0 30
5000 DATADATE,PHONE #,TIME,COST
5100 REM      READ DATA
5110 FOR X2=1 TO 4 : READ D$(X2) : NEXT : LI$="LINE #" : RETURN
```

CHANGES

As it stands, the program limits the number of company files to 9 and the number of monthly numbers entered to 250. To change the phone number limit, modify the DIM statements on line 20 with the variables PN\$(250) and F1(250).

Do not attempt to run a sort unless you have placed at least one phone number under each company file which you have created. Otherwise, when the machine opens a company file it won't find any phone numbers there to compare and will end with an error. However, this is really no problem, because there would never be an occasion in which you would create a file and not have at least one number to put in it.

Dan Keen and Dave Dischert
Soft Horizons
RD 1 Box 432
State Highway 83
Cape May C.H., NJ 08210 ■

CORRECTION

The program that was published with "The Transportation Method of Linear Programming" in the August 1982 issue was unfortunately incorrect. The entire program that appears there should be replaced by the following:

```

10 CLEAR 800: ON ERROR GOTO 720 :REM "TRANS"
20 A$="### #### ### ### ### ###.## ###.##
   ###.##"
30 CLS: PRINT "TRANSACTION PROGRAM ": INPUT "DATA NAME";F$:
INPUT "DISK";X$
40 FX$=F$+":"+X$: PRINT: INPUT "MAXIMUM NUMBER OF
TRANSACTIONS";D: DIM A%(D,4),A#(D,2)
50 INPUT "SELECT DISK OR KEY INPUT (D OR K)";T$:
60 IF T$="K" THEN 110
70 IF T$<>"D" THEN 50
80 I=1:OPEN"I",1,FX$
90 FOR J=1 TO 4: INPUT #1,X%:A%(I,J)=X%: NEXT J:K=I: INPUT
#1,X#,Y#:A#(I,1)=X#:A#(I,2)=Y#: IF A%(I,1)=0 THEN 150
100 I=I+1: GOTO 90
110 PRINT "CHECK NO., MONTH+DAY,ACCOUNT-DEBIT,CREDIT,
AMOUNT-DEBIT,CREDIT":K=1
120 FOR Z=K TO D:K=Z
130 INPUT A%(Z,1),A%(Z,2),A%(Z,3),A%(Z,4),A#(Z,1),A#(Z,2): IF
A%(Z,1)=0 THEN 150
140 NEXT Z
150 CLOSE 1: INPUT "INPUT LINE NUMBERS TO BE LISTED OR 0,0
WHEN COMPLETE";A,B
160 IF A=0 THEN 190
170 CLS: PRINT "NO TRANS DATE ACC-DEBIT ACC-CREDIT
AMT-DEBIT AMT-CREDIT"
180 FOR I=A TO B: PRINT USING A$;I,A%(I,1),A%(I,2),A%(I,3),
A%(I,4),A#(I,1),A#(I,2): NEXT I
190 INPUT "SELECT LINE NUMBER TO BE CHANGED, 0 TO LIST, -1 TO
ADD DATA, -2 TO RECORD, -3 TO INSERT, -4 TO DELETE, -5 TO SUM
DEBITS/CREDITS, -6 FOR PRINTING OR -7 TO RETURN TO GLMENU";P
200 IF P=-7 THEN LOAD"GLMENU",R
210 IF P=0 THEN 150
220 IF P=-1 THEN PRINT "CK NO,MO+DAY,ACCOUNT DEBIT-CREDIT,
AMOUNT DEBIT-CREDIT": GOTO 120
230 IF P=-2 THEN 680
240 IF P=-6 THEN 410
250 IF P<>-3 THEN 320
260 INPUT "NUMBER OF INSERTED LINE 0 TO DEFAULT";P: IF P=0
THEN 190
270 K=K+1:W=0:FOR I=D-1 TO P STEP-1: IF A%(I,1)=0 THEN 300
280 IF W=0 THEN W=1:FOR J=1 TO 4:A%(I+2,J)=A%(I+1,J): NEXT J:
FOR J=1 TO 2 : A#(I+2,J)=A#(I+1,J): NEXT J
290 FOR J=1 TO 4:A%(I+1,J)=A%(I,J): NEXT J: A#(I+1,1)=A#(I,1)
: A#(I+1,2)=A#(I,2)
300 NEXT I
310 GOTO 400
320 IF P<>-4THEN360
330 INPUT"LINE NUMBER TO DELETE 0 TO DEFAULT";P: IF P=0 THEN
190
340 K=K-1: FOR I=P TO D-1: IF A%(I,1)=0 THEN FOR J=1 TO 4:
A%(I,J)=0: NEXT J: FOR J=1 TO 2:A#(I,J)=0: NEXT J: GOTO 180
350 FOR J=1 TO 4:A%(I,J)=A%(I+1,J): NEXTJ : A#(I,1)=A#(I+1,1)
: A#(I,2)=A#(I+1,2): NEXT I: GOTO 180

```

```

360 IF P<>-5 THEN 400
370 SD#=0:SC#=0: FOR I=1 TO D: IF A%(I,1)=0 THEN 390
380 SD#=SD#+A#(I,1):SC#=SC#+A#(I,2): NEXT I
390 BA$="###,###,###.##": PRINT"SUM DEBITS ";: PRINT USING
BA$;SD#;: PRINT " SUM CREDITS ";: PRINT USING BA$;SC#: GOTO
190
400 PRINT "CK NO.,MO+DAY, ACCOUNT-DEBIT,CREDIT, AMOUNT-DEBIT,
CREDIT":INPUT A%(P,1),A%(P,2),A%(P,3),A%(P,4),A#(P,1),A#(P,2)
: GOTO 180
410 INPUT "LINE COUNTER (Y/N)";LC$: IF LC$="Y" THEN CMD
"FORMS(T)"
420 XX$=" NO. CK NO. MO+DAY DEBIT CREDIT $DEBIT
$CREDIT $BALANCE"
430 INPUT "INPUT DATE OF RUN XX/XX/XX";DA$
440 Z$=" BALANCE #####.##"
450 INPUT "INPUT ORIGINAL BALANCE";BA#:SD#=0:SC#=0
460 LPRINT " ":LPRINT " DATE ";DA$:LPRINT USING Z$;BA#
470 LPRINT XX$
480 CLS: PRINT "PRINTER MENU": PRINT " 1 ALL
ACCOUNTS": PRINT " 2 SELECTED TRANSACTIONS": PRINT
" 3 SELECTED DATES": PRINT " 4 SELECTED
ACCOUNT": INPUT GH%
490 IF GH%=1 THEN 560
500 IF GH%<2 THEN 520
510 INPUT "INPUT MINIMUM AND MAXIMUM TRANSACTION NUMBERS";
SS%,BB%: GOTO 560
520 IF GH%<3 THEN 540
530 INPUT "INPUT EARLYEST DATE AND LATEST DATE (MODA)";
SS%,BB%: GOTO 560
540 IF GH%<4 THEN 480
550 INPUT "ACCOUNT YOU WISH TO EXAMINE";SS%
560 FOR I=1 TO D: IF A%(I,3)=1 THEN BA#=BA#+A#(I,1)
570 IF A%(I,4)=1 THEN BA#=BA#+A#(I,2)
580 IF A%(I,1)=0 THEN BA$="###,###,###.##":LPRINT "SUM DEBITS
";: LPRINT USING BA$;SD#;:LPRINT " SUM CREDITS ";: LPRINT
USING BA$;SC#: GOTO 190
590 IF GH%=1 THEN 650
600 IF GH%=2 AND SS%<=A%(I,1) AND BB%>=A%(I,1) THEN 650
610 IF GH%=3 AND SS%<=A%(I,2) AND BB%>=A%(I,2) THEN 650
620 IF GH%=4 AND A%(I,3)=SS% THEN 650
630 IF GH%=4 AND A%(I,4)=SS% THEN 650
640 GOTO 660
650 LPRINT USING A$;I,A%(I,1),A%(I,2),A%(I,3),A%(I,4),
A#(I,1),A#(I,2),BA#:SD#= SD#+A#(I,1):SC#=SC#+A#(I,2): NEXT I
660 NEXT I: LPRINT "SUM DEBITS ";:LPRINT USING BA$;SD#, " SUM
CREDITS ";: LPRINT USING BA$;SC#
670 GOTO 190
680 OPEN"O",1,FX$: FOR IX=1 TO D: FOR IQ=1 TO 2:
DZ#=INT(1000*A#(IX,IQ))/1000:DX#=A#(IX,IQ)-DZ#:
A#(IX,IQ)=DZ #: IF DX#>.005D THEN A#(IX,IQ)=A#(IX,IQ)+.01D
690 NEXT IQ,IX:IX=0
700 IX=IX+1: PRINT #1,A%(IX,1);A%(IX,2);A%(IX,3);A%(IX,4);:
FOR IQ=1 TO 2: PRINT #1,A#(IX,IQ): NEXT IQ: IF IX<D THEN 700
710 CLOSE 1: GOTO 190
720 RESUME 730
730 PRINT "AN ERROR HAS OCCURRED SAVE YOUR FILES--ON NEW DISK
IF NECESSARY": PRINT: GOTO 190

```


PROGRAM CONVERSION (PART 10)

Richard Kaplan

After nine months of writing this series, I have amassed an abundance of reading material pertaining to program conversion between the MODEL I, MODEL II, MODEL III, APPLE, and CP/M computers. No doubt this information may be a bit cumbersome to read completely and utilize; therefore, I will devote a large portion of this month's article to a presentation of charts summarizing most information which I have presented in the last nine months.

CONVERSION TO MODEL I/III FROM MODEL II

MODEL II COMMAND	MODEL I/III EQUIVALENT	ISSUE #
PRINT @ X	PRINT @ (INT(X/80)*64) + (X-INT(X/80)*80))	44
OPEN "R",1,"XXX",128	OPEN "R",1,"XXX" (MOD I ONLY)	44
OPEN "D",1,"XXX"	OPEN "R",1,"XXX"	44
OPEN "E",1,"XXX"	READ AND REWRITE FILE	44
SWAP A,B	T=A:A=B:B=T OR CMD"F=SWAP",A,B (UNDER NEWDOS/80)	47, 50
ERASE A\$	CMD"F=ERASE",A\$ (NEWDOS/80) CMD"L"A\$(0) (MULTIDOS)	47, 50
PRINT USING "/ /"	PRINT USING "% %"	47
A MOD B	A-INT(A/B)*B	47
SYSTEM"I"	NOT NECESSARY	47
SYSTEM	CMD"S"	47
SYSTEM"XXX"	CMD"XXX" (ONLY WITH AN ALTERNATIVE DOS) (MOD I) CMD"I","XXX" (TRSDOS 1.3)	47
SYSTEM"SCREEN"	SHFT DWN ARW * (MOD III OR DOSPLUS AND MOD I) JKL (MOD I OR III WITH NEWDOS/80)	48
ERR	ERR/2 + 1 (ALSO CHANGE ERROR CODES)	48,49
PRESSING HOLD KEY	PRESS SHIFT @	48

CONVERSION TO MODEL II FROM MODEL I/III

MODEL I/III COMMAND	MODEL II EQUIVALENT	ISSUE #
PRINT @ X	PRINT @ (INT(X/64)*80) +(X-(INT(X/64)*64))+320	44
OPEN "E",1,"XXX"	READ AND REWRITE FILE	44
SET (X,Y)	DEF FNA(X)=(INT(X/64)*80) +(X-(INT(X/64)*64))+320: PRINT @ FNA(Y*64+X),CHR\$(158)	44

PRINT USING "% %"	PRINT USING "/ /"	47
IF XXX YYY	IF XXX THEN YYY	48
PRESSING SHIFT @	PRESS HOLD KEY	48
ERR/2+1	ERR (ALSO CHANGE ERROR CODES)	48

CONVERSION TO CP/M FROM MODEL II

MODEL II COMMAND	CP/M EQUIVALENT	ISSUE #
CLS	PRINT CHR\$(X) (DEPENDS ON COMPUTER)	46
PRINT @ X,"ZZZ"	DN=INT(Q/80) AC=Q-INT(Q/80)*80 PRINT CHR\$(X) IF DN<0 THEN PRINT STRING\$(DN,Y); IF AC<0 THEN PRINT STRING\$(AC,Z); PRINT "ZZZ" (X=HOME CURSOR Y=CURSOR DOWN Z=CURSOR ACCROSS)	46
OPEN "R",1,"ZZZ"	CP/M DOES NOT SEARCH DRIVES	46
LOF	MAINTAIN MANUALLY OR COMPUTE	46
FORI=1TO10	FOR I = 1 TO 10 (LEAVE SPACES BETWEEN KEYWORDS)	46
REL=RE+1	RE=RE+1 (CP/M RECOGNIZES 5-LETTER VARIABLES)	46

CONVERSION TO HP MBASIC FROM MICROSOFT BASIC

MICROSOFT COMMAND	HP EQUIVALENT	ISSUE #
LEFT\$(A\$,Y)	A\$(1,Y)	49
RIGHT\$(A\$,Y)	A\$(LEN(A\$)-Y+1,LEN(A\$))	49
MID\$(A\$,X,Y)	A\$(X,X+Y-1)	49
C\$=A\$+B\$	C\$=A\$:C\$(LEN(C\$)+1)=B\$	49
ARRAY HANDLING	SEE TEXT OF ARTICLE	49

CONVERSION TO APPLE FROM TRS-80

TRS-80 COMMAND	APPLE EQUIVALENT	ISSUE #
CLS	HOME	45
DISK ACCESS	SEE TEXT OF ARTICLE	45

A PRACTICAL EXAMPLE

I recently received a letter from Stuart Reiner, 222 West 15th Street, New York, NY 10011. I believe his letter is appropriate for this column, because it is an excellent example of the need for program conversion techniques, and it can also help to explain the process one must utilize when attempting to convert BASIC programs.

Dear Mr. Kaplan:

I own a TRS-80 MODEL III (48K) with one disk drive. I have been encountering difficulties in translating a program written for the Apple II in Integer BASIC. I use TRSDOS.

The programs I have been trying to convert are part of a Pro Football predicting system included in the book "BASIC Betting — The Micro-Computer Edge" by James Jasper (a copy of the program as written by Mr. Jasper is enclosed).

I have enclosed a copy of the program as translated by me. The program runs through all right, except for the loop contained in the program at lines 7150 and 10235. I have tried entering the FOR and NEXT statements in several different ways, but I have been unsuccessful at all attempts to get the program to execute the loop. At this point the program is supposed to return so that information for a second team may be entered and then the third team, etc. until the information for all 28 teams for the current week has been entered.

I would appreciate any help you can give me in overcoming this problem.

Thank you very much.

Very truly yours,
Stuart Reiner, CPA

For legal reasons, it is not possible for me to reproduce the entire program listing here which Mr. Reiner sent to me. Instead, I will include only those portions of the program which required conversion.

VS. <>

In the original (Integer BASIC) program, there were a number of lines which were similar to the following:

```
300 IF A$#A1$ THEN 310:A=1:RETURN
```

This line contains a "#", which represents "not equal to" on the APPLE in Integer BASIC. On the MODEL-III (or any other TRS-80, for that matter), the "not equal to" operator is "<>". As a result, our corrected line should read as follows:

```
300 IF A$<>A1$ THEN 310: A=1: RETURN
```

The substitution of <> for # is a snap. This should be an easy conversion. Right? Wrong! There is one more element of this line which still must be converted.

IF ... THEN

If you are at all experienced with TRS-80 programming and you examine the above line, you will see that the end of the line, i.e., "A=1:RETURN", would never be executed on a TRS-80. If an "IF" condition is true on the TRS-80, each command on the line is then executed. If the condition is false, execution of the program jumps to the next line number. On a TRS-80, then, if A\$ were not equal to A1\$, program execution would jump to line 310, since there is a GOTO statement there. The portion of the line which reads "A=1:RETURN" would never be executed.

On the APPLE with Integer BASIC (NOT with APPLESOFT), the end of the line would be executed if the "IF" clause were not true. An equivalent set of program lines for a TRS-80, then, would be the following:

```
300 IF A$<>A1$ THEN 310
305 IF A$=A1$ THEN A=1:RETURN
```

IF ... THEN ... ELSE

There is a programming concept on the TRS-80's which could reduce the two lines above into one line. The sequence "IF ... THEN ... ELSE" is that concept. In the two lines above, IF A\$ is equal to A1\$, THEN program execution branches to line 310, or ELSE A is set to 1 and the subroutine is terminated. In computerese, we could state this as follows:

```
300 IF A$<>A1$ THEN 310 ELSE A=1:RETURN
```

DISK ACCESS AND CHR\$(4)

In May, 1982 (issue # 45), I discussed in-depth the handling of APPLESOFT disk files, which are virtually identical to Integer disk files. However, there is a particular point, which was needed in Mr. Reiner's program, which may very well cause quite a bit of confusion. Examine the following set of lines, which appeared in the program Mr. Reiner sent in:

```
10 D$=""
20 PRINT D$;"OPEN WEEKLY";GNO
7000 PRINT D$;"WRITEWEEKLY";GNO

7003 PRINT #1,A$
7160 PRINTD$;"CLOSEWEEKLY";GNO
```

A knowledgeable but not completely experienced TRS-80 programmer might see this APPLE program and translate it as follows:

```
10 D$=""
20 PRINT D$:OPEN "O",1,"WEEKLY":PRINT GNO
7000 PRINT D$:PRINT #1,"WRITEWEEKLY";GNO
7003 PRINT #1,A$
7160 CLOSE #1
```

Let's now examine this attempted conversion and see what might have been easily overlooked:

```
10 D$=""
```

Line 10 in the APPLE program appears innocent enough. Variable A\$ is simply being set to a length of 0. Right? Wrong! As I mentioned in my May column, D\$ is frequently used to denote CHR\$(4), which is needed on the APPLE to specify a disk command. However, CHR\$(4), which is CTRL-D, is not actually printed on the screen, even though it is part of the program. The original program author should have documented this in his program. However, since he didn't, we must realize this from context. Since CHR\$(4) is not needed for TRS-80 disk access, we can delete this line.

```
20 PRINT D$;"OPEN WEEKLY";GNO
20 PRINT D$:OPEN"O",1,"WEEKLY":PRINT GNO
```

This conversion again seems to be quite obvious. The original statement prints D\$, opens the file, and prints the value of GNO. Right? Wrong again.

As with our previous example, D\$, which is equal to CHR\$(4), is not needed on the TRS-80's. The OPEN command was not converted correctly either. On the APPLE, if GNO is equal to 1, the command PRINT D\$;"OPEN WEEKLY";GNO will open file WEEKLY1. On the TRS-80, the name of the file must be a string; it cannot be composed of a string portion

continued on page 63

SOFTWARE REVIEW

Defense Command from Big Five Software

John Wilson

Are you looking for a fast-action, truly challenging game? Look no further. Defense Command from Big Five Software is the game for you. While the game is modelled after the popular arcade game, there are quite a few changes that have been made.

You start out with 3 space ships and 4 anti-matter bombs. You are alone, trying to protect 10 KROTNium fuel cells from the KROMORFKROM galaxy. As the enemies fly down, you must position your ship directly below them, then fire. If you miss, you won't be able to fire again until the laser shot leaves the screen. You are awarded 40 to 90 points for each alien shot. If an alien gets down to the bottom, he will grab a canister and fly off with it. Shooting him will award double his value, and the cell will start to fall. Being very fragile (the price you pay for nuclear power), you must catch the cells, or they will explode. A caught cell awards either 300 or 400 points.

As your skills improve, there are more aliens, each moving faster. If the situation gets out of hand, an anti-matter bomb (AMB) can be used. Pressing any of the number keys (0-9), or aiming the joystick up will detonate one of the bombs. All aliens on the screen are destroyed, and any cells the aliens were carrying will fall.

There are two special alien ships that should be mentioned. These are the Flagship and the Slicer. The flagship is the same on as in Robot Attack and Attack Force, but is no danger here. It flies along at different levels, carrying a cargo of ships. The flagship is worth 500 points, but any aliens inside will be released. The slicer has been programmed to destroy fuel cells. The explosion from the cell will destroy the slicer. A slicer appears only when your supply of cells is low, or when released from the flagship.

The game ends when you run out of ships or all of the fuel cells have been destroyed. As an aid in playing the game, an extra ship will be sent to you every 10,000 points. At every 5,040 points, you will receive another AMB.

This is one of the better games available today. It has clear, fast graphics, along with excellent sound. One or two people can play the game, with the 10 highest scores saved. It is an excellent program, and is very addictive.

For those of you who like to get a higher score than the program gives, I have found out the way to get a higher canister bonus. Load the program normally, but do not execute it. Go into the basic Ready mode, and type: POKE 24616,62:POKE 24617,6:POKE 24619,0:POKE 24620,0 After this, type "SYSTEM", then "/18750". You should receive 900 points for each cell caught. To get a larger bonus, increase the value that is poked into location 24617.

John Wilson
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MACSMAP

W. G. MacSwain

"MACSMAP" is a program that creates a map of the

entire granule usage of a diskette, showing what is assigned to what files. It is written for a 48K TRS-80 Model I with a printer and will work with TRSDOS, NEWDOS, NEWDOS80 Version 1, and LDOS. Since being written, it has been

subjected to much use.

The program works by poking an assembly language routine into high memory (A000H) that reads the target diskette's complete directory into memory starting at B000H.

***** M A C S D I S K M A P *****

```
DISKETTE - NEWDOS          07/01/80
TRACKS - AVAILABLE 35      LOCKED OUT 5
GRANULES - ASSIGNED 54      FREE 16      FXDE'S - 0
SECTORS - ASSIGNED 270      FREE 80      FPDE'S - 19
```

```
TRACK> <1ST GRANULE>          <2ND GRANULE>          <FILE LENGTH>
DC HX>-----SECTORS 0-4>-----<SECTORS 5-9>-----<SECTORS/BYTES-EXTENTS
*****
```

```
0 00 < 1 BOOT /SYS 1> < 1 SYS0 /SYS 3> WORDP/NEW 25/147-2
1 01 < 2 SYS0 /SYS 3> < 3 SYS0 /SYS 3> DATABASE 24/175-2
2 02 < 1 FORMAT /CMD 3> < 2 FORMAT /CMD 3> FILES 55/121-3
3 03 < 3 FORMAT /CMD 3> < 1 BASIC /CMD 4> WORDP/OLD 25/32-1
4 04 < 2 BASIC /CMD 4> < 3 BASIC /CMD 4>
5 05 < 1 DATABASE /SYS 5> < 2 DATABASE /SYS 5>
6 06 < 3 DATABASE /SYS 5> < 1 COPY /CMD 1>
7 07 < 4 DATABASE /SYS 5> < 5 DATABASE /SYS 5>
8 08 < 1 WORDP /NEW 6> < 2 WORDP /NEW 6>
9 09 < 3 WORDP /NEW 6> < 4 BASIC /CMD 4>
10 0A < 4 WORDP /NEW 6> < 5 WORDP /NEW 6>
11 0B < 6 WORDP /NEW 6> < 1 FILES 12>
12 0C < 2 FILES 12> < 1 SYS13 /SYS 1>
13 0D < 3 FILES 12> < 4 FILES 12>
14 0E < 5 FILES 12> < 6 FILES 12>
15 0F < 7 FILES 12> < 8 FILES 12>
16 10 < 1 SYS1 /SYS 1> < 1 SYS2 /SYS 1>
17 11 < 1 DIR /SYS 2> < 2 DIR /SYS 2>
18 12 < 1 SYS3 /SYS 1> < 1 SYS4 /SYS 1>
19 13 < 1 SYS5 /SYS 1> < 1 SYS6 /SYS 3>
20 14 < 2 SYS6 /SYS 3> < 3 SYS6 /SYS 3>
21 15 < 1 WORDP /OLD 6> < 2 WORDP /OLD 6>
22 16 < 3 WORDP /OLD 6> < 4 WORDP /OLD 6>
23 17 < 5 WORDP /OLD 6> < 6 WORDP /OLD 6>
24 18 < 9 FILES 12> <10 FILES 12>
25 19 <11 FILES 12> <12 FILES 12>
26 1A < 0 -- FREE -- 0> < 0 -- FREE -- 0>
27 1B < 0 -- FREE -- 0> < 0 -- FREE -- 0>
28 1C < 0 -- FREE -- 0> < 0 -- FREE -- 0>
29 1D < 0 -- FREE -- 0> < 0 -- FREE -- 0>
30 1E < 0 -- FREE -- 0> < 0 -- FREE -- 0>
31 1F < 0 -- FREE -- 0> < 0 -- FREE -- 0>
32 20 < 1 SYS11 /SYS 1> < 0 -- FREE -- 0>
33 21 < 0 -- FREE -- 0> < 0 -- FREE -- 0>
34 22 < 0 -- FREE -- 0> < 1 SYS12 /SYS 1>
35 23 < 0 LOCKED OUT 0> < 0 LOCKED OUT 0>
36 24 < 0 LOCKED OUT 0> < 0 LOCKED OUT 0>
37 25 < 0 LOCKED OUT 0> < 0 LOCKED OUT 0>
38 26 < 0 LOCKED OUT 0> < 0 LOCKED OUT 0>
39 27 < 0 LOCKED OUT 0> < 0 LOCKED OUT 0>
```

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Example 1: "Macs Disk Map" for a sample diskette.

DRIVE	1	NEWDOS	07/01/80	35	TRKS	45	FDES	16	GRANS
WORDP/NEW			256=LRECL		26	RECS		6	GRANS
DATABASE			256=LRECL		25	RECS		5	GRANS
FILES			256=LRECL		56	RECS		12	GRANS
WORDP/OLD			256=LRECL		26	RECS		6	GRANS

Example 2: A disk directory (with attributes) under NEWDOS80 Version 1 for the same diskette as in Example 1.

When told to "Load Target Diskette in Drive 0 and Push <Enter>", you can, as an alternative, put the diskette in drive 1, key in a 1, and then <Enter>. Both of these produce a "file length" listing (far right column) that suppresses invisible and system files. If all files are required, put the target diskette into drive 0, key in a 2, and then <Enter>.

The program builds several arrays as it goes through the "GAT" table to see how many granules are used, free or locked out. Next it goes through all the FXDEs and FPDEs, displaying a countdown on the screen and again building arrays. Finally, printing begins as the arrays are checked for the appropriate codes on each track. Simultaneously the file names are printed down the right column with the number of sectors/bytes, and extents for each.

The file name for each granule on the map is followed by a number indicating the total number of granules that file has. The number preceding the file name indicates what number that particular granule is.

Example 1 shows a sample map performed on a 40-track diskette under NEWDOS80 Version 1. BOOT/SYS occupies track 0, granule 1 (sectors 0-4), SYS0/SYS track 0, granule 2 through track 1, granule 2, etc. The file named "FILES" has three allocations or extents: the first is track 11 granule 2 through track 12 granule 1, the second track 13 granule 1 through track 15 granule 2, and the third track 18 granule 1 through track 19 granule 2. (The last five tracks are shown as being locked out because the diskette is formatted only for 35 tracks.) Example 2 shows a disk directory with attributes performed for the same diskette.

To save time while typing in the program, omit any comment line (line that begins with an apostrophe).

```
100 'MACSMAP' - 2/10/81 VER 1.2 - 48K
101 ' COPYRIGHT (C) 1981 BY MACSWAIN ENTERPRISES
102 ' 151 CASS AVENUE, AGINCOURT, ONTARIO M1T 2B5
103 ' ALL RIGHTS RESERVED
105 ' LOAD 'DISK READING' PROGRAM INTO MEMORY AT A000H.
```

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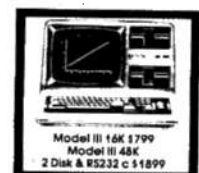
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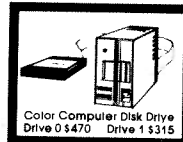
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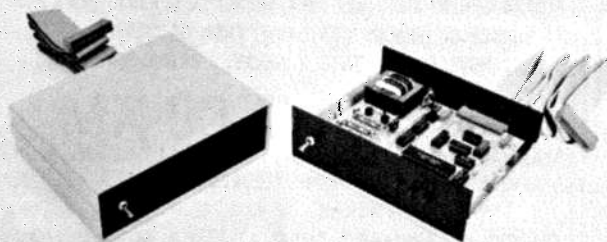
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```

110 FORX=-24576TO-24441:READY:POKEX,Y:NEXT
115 ' 'CLEAR' REQUIRED TO RESET VARIABLES FOR SECOND TIME
THROUGH.
116 ' Y(2,3,40): GRAN 1 OR 2: HOW USED, TOT GRANS, GRANS SO
FAR: TRACK
117 ' YN$(2,40): FILE NAME-GRAN 1 OR 2: TRACK
118 ' SN$: FILE NAME: - SN(3,64): NO OF SECTORS, NO OF
BYTES, NO OF EXTENTS
120 CLEAR6000:DIMY(2,3,40),YN$(2,40),SN$(64),SN(3,64)
125 ' PRINT SCREEN TITLE AND INSTRUCTIONS:
126 ' <ENTER> = READ DRIVE 0, SKIP SYS & INVIS
FILES
127 ' 1 <ENTER> = READ DRIVE 1, SKIP SYS & INVIS
FILES
128 ' 2 <ENTER> = READ DRIVE 0, PRINT ALL FILES
130 CLS:PRINTCHR$(23);:PRINT@334,"M A C S M A P":PRINT
140 PRINT:PRINT"LOAD TARGET DISKETTE IN DRIVE 0"
150 Y$="":LINEINPUT" PUSH <ENTER>";Y$
155 ' SELECT DRIVE 1
160 IFY$="1"THENPOKE-24574,2:POKE-24507,2:Y$=""
165 ' GO READ DISK AND RETURN HERE - RESTORE DRIVE 0
SELECTION.
170 DEFUSR1=8HA000:B=USR1(B):POKE-24574,1:POKE-24507,1
175 ' A=BYTE BEFORE FIRST BYTE OF SECTOR 0 DIRECTORY
(AFFFH).
176 ' H$=DECIMAL TO HEX CONVERSION STRING.
180 A=-20481:MA$="###":H$="0123456789ABCDEF"
185 ' PRINT PAGE HEADER.
190 PRINT@400,"T U R N O N P R I N T E R !"
200 LPRINTSTRING$(22,"*");"M A C S D I S K M A P
";STRING$(23,"*"):CLS:LPRINT
205 ' PRINT DISKETTE NAME AND CREATION DATE.
210 LPRINT"DISKETTE - ";
220 FORX=209TO216: LPRINTCHR$(PEEK(A+X));: NEXTX: LPRINT
STRING$(10," ");
230 FORX=217TO224: LPRINTCHR$(PEEK(A+X));: NEXTX: LPRINT
235 ' COUNT NUMBER OF TRACKS AVAILABLE FROM GAT TABLE. IF
TRACK LOCKED OUT, MOVE CODE 2 INTO Y ARRAY. PRINT BOTH
TOTALS.
240 T=0:R=0:FORX=97TO136
250 IFPEEK(A+X)=252THENT=T+1
260 IFPEEK(A+X)=255THENY(1,1,X-96)=2:Y(2,1,X-96)=2
270 NEXT
280 LPRINT"TRACKS - AVAILABLE ";
290 LPRINTUSINGMA$,T;:LPRINT" LOCKED OUT ";:LPRINT USING
MA$,40-T
294 ' BUILD Y ARRAY ACCORDING TO GAT TABLE ASSIGNMENTS:
295 ' 255(FE)= BOTH GRANS USED
296 ' 254(FE)= #1 FREE, #2 USED
297 ' 253(FD)= #1 USED, #2 FREE
298 ' 252(FC)= BOTH GRANS FREE
299 ' PRINT 'ASSIGNED' AND 'FREE' TOTALS.
300 FORX=1TO40
310 Z=PEEK(A+X)
320 IFZ=255THEN370
330 IFZ=254THENY(1,1,X)=1:R=R+1:GOTO370
340 IFZ=253THENY(2,1,X)=1:R=R+1:GOTO370
350 IFZ=252THENY(1,1,X)=1:Y(2,1,X)=1:R=R+2:GOTO370
360 PRINT"DIRECTORY ERROR - USE DIRCHECK/CMD":END
370 NEXT
380 LPRINT"GRANULES - ASSIGNED ";

```

```

390 LPRINTUSINGMA$;(T*2)-R;:LPRINTSTRING$(10," ");:FREE
";USINGMA$;R;
395 ' A=FIRST BYTE OF SECTOR 2 (B200H). CHECK ALL FPDE'S
FOR FXDE'S. BYTE 0 MUST INDICATE IT IS NOT ITSELF AN FXDE,
BUT THE SECOND LAST BYTE MUST SHOW IT HAS ONE (FE). IF YES,
HANDLE IN SUBROUTINE. 2ND BYTE ZEROED TO FACILITATE
NEWDOS80-V2
400 A=-19968:PRINT@408,"- FXDE CHECK -"
410 FORX=0TO63:POKEA+(X*32)+1,0:POKEA+(X*32)+2,0
420 IF PEEK(A+(X*32))>0 AND PEEK(A+(X*32))<128 AND
PEEK(A+(X*32)+30)=254 THEN GOSUB 1060
430 NEXTX
435 ' PRINT NUMBER OF FXDE'S.
440 LPRINTSTRING$(10," ");:FXDE'S -";USINGMA$;XD
450 LPRINT"SECTORS - ASSIGNED ";:LPRINTUSINGMA$;((T*2)-R)*5;:
LPRINTSTRING$(10," ");:FREE
";USINGMA$;R*5;
455 ' CHECK ALL FPDE'S. IF ACTIVE, GO AND HANDLE IN
SUBROUTINE.
460 FORX=0TO63
470 IFPEEK(A+(X*32))=0THEN490
480 GOSUB730
490 PRINT@408,"COUNTDOWN ";64-X:NEXTX:CLS
495 ' PRINT NUMBER OF FPDE'S.
500 LPRINTSTRING$(10," ");:FPDE'S -";USINGMA$;FP
505 ' PRINT PAGE TITLE.
510 LPRINT:LPRINT"TRACK> <1ST GRANULE> <2ND
GRANULE> <FILE LENGTH>":LPRINT"DC HX>";:----<SECTORS
0-4>";STRING$(10,"-");:<SECTORS
5-9>";STRING$(4,"-");:<SECTORS/BYTES-EXTENTS": LPRINT
STRING$(7,2,"*")
513 '
514 '***** PRINTING ROUTINE *****
515 '
516 ' START OF 40 TRACK PRINTOUT.
520 FORX=1TO40:C$=CHR$(X-1)
525 ' CONVERT TRACK NUMBER TO HEX. PRINT BOTH.
530 LPRINTUSING"###";X-1;:LPRINT" ";:LPRINTMID$(H$,
((ASC(C$)AND240)/16)+1,1);MID$(H$, (ASC(C$)AND15)+1,1);
535 ' 2-UP PRINTING OF GRANS 1 AND 2.
536 ' CHECK CODES- 0=USED, 1=FREE, 2=LOCKED OUT.
540 FORW=1 TO 2
550 IFY(W,1,X)=1THENYN$(W,X)=" -- FREE -- "
560 IFY(W,1,X)=2THENYN$(W,X)=" LOCKED OUT "
565 ' NUMBER THIS GRAN.
570 LPRINT" <";USING"###";Y(W,2,X);
575 ' NAME OF FILE AND TOTAL GRANS IT HAS.
580 LPRINT" ";YN$(W,X);" ";USING"###";Y(W,3,X);
590 LPRINT"> ";
600 NEXTW
605 ' IS THERE A FILE TO LIST FOR 'LENGTH' COLUMN?
610 NS=NS+1
620 IFSN$(NS)=""THENLPRINT:GOTO700
630 LPRINT;
635 ' PRINT NAME WITHOUT BLANKS.
640 FORJ=1TO12
650 IFMID$(SN$(NS),J,1)=" "THEN670
660 LPRINTMID$(SN$(NS),J,1);
670 NEXTJ
675 ' PRINT NUMBER OF COMPLETE SECTORS, BYTES LEFT OVER, AND
EXTENTS.

```


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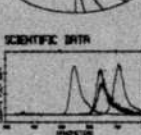
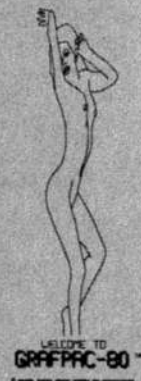
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```

680 IFSN(1,NS)<>OTHENSN(2,NS)=SN(2,NS)-1
690 LPRINT STR$(SN(2,NS));"/"; RIGHT$(STR$(SN(1,NS)),
LEN(STR$(SN(1,NS)))-1);"-";RIGHT$(STR$(SN(3,NS)),
LEN(STR$(SN(3,NS)))-1)
700 NEXTX
705 ' PROVISION FOR THERE BEING MORE THAN 40 FPDE'S.
710 IFNF>NSTHENLPRINT"DISK CONTAINS > 40 ENTRIES - RUN
DIRCHECK FOR COMPLETE SECTOR/BYTE COUNT LIST"
715 ' FINISHED - RETURN TO START.
720 LPRINTSTRING$(16," ");"COPYRIGHT (C) 1981 BY MACSWAIN
ENTERPRISES":GOTO120
721 '
722 '
723 '
724 '***** FILE PRIMARY DIRECTORY ENTRY (FPDE)
*****
725 '
727 ' (UPON ENTRY A=BYTE 0, SECTOR 2, AND X=REL NO OF FPDE
(0-63).
728 ' GET NAME OF FILE IN N2$. ADD ONE TO FPDE COUNT.
730 N2$="":FORS=5T012
740 N1$=CHR$(PEEK(A+(X*32)+S))
750 N2$=N2$+N1$
760 NEXTS:IFPEEK(A+(X*32))<128THENFP=FP+1
765 ' IS THERE A FILE NAME EXTENSION?
770 IFPEEK(A+(X*32)+13)>32THENN2$=N2$+CHR$(47)ELSEN2$="
"+N2$+" ":GOTO810
775 ' ADD FILE EXTENSION TO NAME.
780 FORS=13T015
790 N2$=N2$+CHR$(PEEK(A+(X*32)+S))
800 NEXTS
805 ' GET NO OF SECTORS IN SEC.
810 SEC=(PEEK(A+(X*32)+21)*256)+PEEK(A+(X*32)+20)
815 ' BYPASS ALL SYSTEM AND INVISIBLE FILES ON 'LENGTH'
LISTING?
820 IFY$=""ANDPEEK(A+(X*32))>16THEN850
825 ' BUILD 'FILE LENGTH' ARRAY SN$(NAME), SN(SECTORS,
BYTES, EXTENTS).
830 NF=NF+1:SN$(NF)=N2$:SN(1,NF)=PEEK(A+(X*32)+3):SN(2,NF)=SEC
835 ' IF AN FXDE FOR 'LENGTH' LISTING, SHOW AS SUCH.
840 IFPEEK(A+(X*32))>127THENSN$(NF)=" -- FXDE -- ":POKE
A+(X*32)+1,0
845 ' CALCULATE TOTAL GRANS AND SECTORS ASSIGNED TO FILE.
850 GR=INT((SEC/5)+.8):SEC=5*GR
855 ' GRANUAL COUNT 'SO FAR' IS PICKED OFF THIS NORMALLY
UNUSED (AND ZERO) BYTE. ONLY FXDE ENTRIES WE HAVE PREVIOUSLY
HANDLED WILL CONTAIN SIGNIFICANT AMOUNTS. Z1=NUMBER OF
EXTENTS FROM FXDE'S (IF ANY).
860 GC=PEEK(A+(X*32)+2)+1:Z1=PEEK(A+(X*32)+1)
865 ' START OF CHECKING POTENTIAL 5 EXTENTS.
866 ' LOAD SN ARRAY - SEE LINE 815.
870 FORS=22T030STEP2:IFY$=""ANDPEEK(A+(X*32))>16 THEN 880
ELSE SN(3,N F)=Z1
875 ' TR=TRACK NUMBER.
880 TR=PEEK(A+(X*32)+S)
885 ' GN=NUMBER OF CONTIGUOUS GRANS THIS EXTENT (MINUS
ONE).
890 GN=PEEK(A+(X*32)+S+1)
895 ' IS THIS EXTENT AN FXDE POINTER?
900 IFTR=254THENRETURN
905 ' THIS INDICATES PREVIOUS ONE WAS THE LAST?
910 IFTR=255ANDGN=255THENRETURN
914 ' ADD 1 TO EXTENT COUNT Z1.
915 ' LL=1ST OR 2ND GRAN ON TRACK. IS THIS ONE THE 1ST?
920 Z1=Z1+1:LL=1:IFGN<32THEN940
925 ' 2ND GRAN. STRIP HIGH ORDER BITS.
930 GN=GN-32:LL=2
935 ' ADJUST GRAN COUNT TO ACTUAL NUMBER.
940 GN=GN+1
945 ' GP=GRAN CONTROL.
950 GP=1
955 ' MOVE NAME TO ARRAY.
960 YN$(LL,TR+1)=N2$
965 ' MOVE TOTAL GRANS TOO.
970 Y(LL,3,TR+1)=GR
975 ' IF THIS AN FXDE, PICK UP CORRECT TOTAL GRANS FROM
NORMALLY UNUSED BYTE 4.
980 IFGR=0THENY(LL,3,TR+1)=PEEK(A+(X*32)+4)
985 ' MOVE 'SO FAR' GRAN COUNT TO ARRAY.
990 Y(LL,2,TR+1)=GC
995 ' INCREMENT 'SO FAR' GRAN COUNT.
1000 GC=GC+1
1005 ' TOTAL GRANS THIS EXTENT AND NUMBER ASSIGNED TO ARRAY
EQUAL?
1010 IFGN=GPTHEXNEXTS
1015 ' INCREMENT GRAN CONTROL.
1020 GP=GP+1
1025 ' GRAN 1ST OR 2ND TO ARRAY?
1030 IFL=1THENLL=2:GOTO960
1035 ' IT WAS 2. RESET LL AND INCREMENT TRACK NUMBER.
1040 LL=1:TR=TR+1
1050 GOTO960
1053 '
1054 '***** FILE EXTENSION DIRECTORY ENTRY (FXDE)
*****
1055 '
1056 ' (UPON ENTRY, A AND X ARE SAME AS IN LINE 727).
1057 ' MOVE FILE NAME (COMPLETE) TO N2$. Z3=ADDRESS OF FPDE
(BYTE 1) EXTENT COUNTER.
1060 Z3=A+(X*32)+1:N2$="":FORS=5T015
1070 N1$=CHR$(PEEK(A+(X*32)+S))
1080 N2$=N2$+N1$:NEXTS
1085 ' CALCULATE TOTAL GRANS ASSIGNED TO FILE.
1090 SEC=(PEEK(A+(X*32)+21)*256)+PEEK(A+(X*32)+20)
1100 GR=INT((SEC/5)+.8)
1105 ' Q=FIRST BYTE OF FPDE AND SUBSEQUENT FXDE(S).
1110 Q=A+(X*32)
1120 GOTO1220
1125 ' AN FPDE (OR FXDE) WAS JUST HANDLED THAT HAD AN FXDE
POINTER. N2$ HAS FILE NAME, TC CONTAINS TOTAL GRANS 'SO FAR',
AND GR IS TOTAL GRANS FOR FILE.
1126 ' TR CONTAINS '254' AND GN HAS THE POINTER TO NEXT FXDE.
CALCULATE THE NEW ADDRESS OF THE FIRST BYTE AND PUT IT IN Q.

```

```

1130 G1=INT(GN/16)
1140 GN=GN-(G1*16)
1150 Q=A+(GN*256)+(G1*16)
1155 ' PUT TOTAL GRANS 'SO FAR' IN REL BYTE 2.
1160 POKEQ+2,TC
1165 ' PUT TOTAL GRANS IN REL BYTE 4.
1170 POKEQ+4,GR
1175 ' PUT FILE NAME IN REL BYTES 5 TO 15 FROM N2$.
1180 FORN3=0TO10
1190 POKEQ+5+N3,ASC(MID$(N2$,N3+1,1))
1200 NEXTN3
1205 ' XD=TOTAL NUMBER OF FXDE'S ON DISKETTE.
1210 XD=XD+1
1215 ' LOOK AT THE EXTENTS- GET NO OF GRANS 'SO FAR'.
1220 TC=PEEK(Q+2)
1225 ' POTENTIAL 4 EXTENTS + A POINTER (OR FILE END).
1230 FORS=22TO30STEP2
1235 ' GET TRACK AND NO OF CONTIGUOUS GRANS.
1236 ' PUT NUMBER OF EXTENTS (LESS 4 FOR FPDE ITSELF) IN
FPDE COUNTER (BYTE 1).
1240 TR=PEEK(Q+S):GN=PEEK(Q+S+1):IFZ2>3THENPOKEZ3,Z2-4
1245 ' IS THIS EXTENT AN FXDE POINTER?
1250 IFTR=254THEN1130
1255 ' WAS LAST EXTENT THE FINAL ONE THIS FILE?
1260 IFTR=255ANDGN=255THENRETURN
1265 ' STRIP HIGH ORDER BITS, GET ACTUAL GRAN COUNT & ADD
TO TOTAL 'SO FAR' COUNT. GO TO NEXT EXTENT. INCREMENT EXTENT
COUNT Z2.
1270 Z2=Z2+1:IFGN>31THENGNGN=GN-32
1280 TC=TC+GN+1:NEXTS
1285 ' MACHINE LANGUAGE PROGRAM READS DIRECTORY (TRACK 11H,
SECTORS 0-9) INTO MEMORY, STARTING AT B000H.
1286 ' IF A DISK ERROR OCCURS, A MESSAGE WILL BE PRINTED &
THE PROGRAM HALTS. PRESSING ANY KEY WILL CAUSE ANOTHER READ
ATTEMPT.
1290 DATA 243,62,1,50,225,55,33,236,55,54,3,1,0,0,205,96,0,
203,70,32,252,205,201,1,14,10,33,0,176,17,0,17
1300 DATA 205,61,160,40,6,13,200,28,36,24,245,33,124,160,6,
12,126,44,205,51,0,16,249,205,73,0,195,0,160,205,65
1310 DATA 160,200,197,213,229,62,1,50,225,55,237,83,238,55,
33,236,55,54,19,197,193,197,193,203,70,32,252,54,136
1320 DATA 193,197,193,197,17,239,55,24,13,230,149,61,32,10,
126,203,79,40,246,26,2,3,24,246,175,182,54,208
1330 DATA 225,209,193,201,13,68,73,83,75,32,69,82,82,79,82,0

```

W. G. MacSwain
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PROGRAM CONVERSION

continued from page 56

and a numeric portion. Therefore, this line could be properly converted as follows:

```

20 OPEN "0",1,"WEEKLY"+STR$(GNO)
PRINT D$;"WRITE WEEKLY";GNO
PRINT D$:PRINT #1;"WRITE WEEKLY";GNO

```

By now we know to ignore D\$'s and to treat numerics as strings when converting APPLE disk statements to the TRS-80. However, here we have an exception. The WRITE command on the TRS-80 is part of the OPEN command, since a file must always be defined as an input file or as an output file. Therefore, WRITE statements on APPLE programs may be deleted on TRS-80 programs, as long as the READ or WRITE is incorporated into an OPEN statement. In some cases, it may be necessary to CLOSE and re-OPEN a file on the TRS-80, whereas on the APPLE a new OPEN statement would be necessary.

CONCLUSION — LOOKING TOWARDS THE FUTURE

This concludes this month's tips on program conversion. As always, I am open to feedback of any type concerning the MODELS I/II/III, APPLE, PET/CBM, IBM, ATARI, and CP/M. In future months, I will expand upon the topics covered over the last 9 issues. At present, I expect to concentrate on the APPLE, PET, and IBM computers, but this may change depending upon reader interest.

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Present home address (Number and street, including apartment number, or rural route)

Spouse's social security no.

City, town or post office, State and ZIP code

Your occupation

Spouse's occupation

Presidential

Election Campaign

Do you want \$1 to go to this fund?

Yes

Yes

No

No

If joint return, does your spouse want \$1 to go to this fund?

Yes

Yes

No

No

Note: Checking "Yes" will
not increase your tax or re-
duce your refund.MICROMATIC
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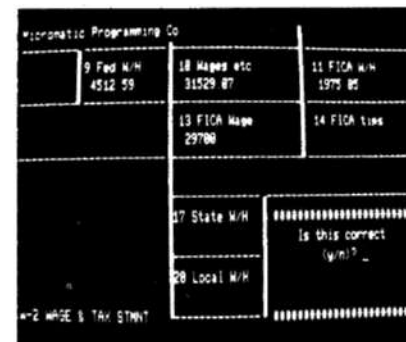
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NAME DESCRIPTION

1 RULE78	Interest Apportionment by Rule of the 78's
2 ANNU1	Annuity computation program
3 DATE	Time between dates
4 DAYYEAR	Day of year a particular date falls on
5 LEASEINT	Interest rate on lease
6 BREAKEVN	Breakeven analysis
7 DEPRSL	Straightline depreciation
8 DEPRSY	Sum of the digits depreciation
9 DEPRDB	Declining balance depreciation
10 DEPRDDB	Double declining balance depreciation
11 TAXDEP	Cash flow vs. depreciation tables
12 CHECK2	Prints NEBS checks along with daily register
13 CHECKBK1	Checkbook maintenance program
14 MORTGAGE/A	Mortgage amortization table
15 MULTMON	Computes time needed for money to double, triple, etc.
16 SALVAGE	Determines salvage value of an investment
17 RRVARIN	Rate of return on investment with variable inflows
18 RRCONST	Rate of return on investment with constant inflows
19 EFFECT	Effective interest rate of a loan
20 FVAL	Future value of an investment (compound interest)
21 PVAL	Present value of a future amount
22 LOANPAY	Amount of payment on a loan
23 REGWITH	Equal withdrawals from investment to leave 0 over
24 SIMPDISK	Simple discount analysis
25 DATEVAL	Equivalent & nonequivalent dated values for oblig.
26 ANNUEDEF	Present value of deferred annuities
27 MARKUP	% Markup analysis for items
28 SINKFUND	Sinking fund amortization program
29 BONDVAL	Value of a bond
30 DEplete	Depletion analysis
31 BLACKSH	Black Scholes options analysis
32 STOCVAL1	Expected return on stock via discounts dividends
33 WARVAL	Value of a warrant
34 BONDVAL2	Value of a bond
35 EPSEST	Estimate of future earnings per share for company
36 BETAALPH	Computes alpha and beta variables for stock
37 SHARPE1	Portfolio selection model-i.e. what stocks to hold
38 OPTWRITE	Option writing computations
39 RTVAL	Value of a right
40 EXVAL	Expected value analysis
41 BAYES	Bayesian decisions
42 VALPRINF	Value of perfect information
43 VALADINF	Value of additional information
44 UTILITY	Derives utility function
45 SIMPLEX	Linear programming solution by simplex method
46 TRANS	Transportation method for linear programming
47 EOQ	Economic order quantity inventory model
48 QUEUE1	Single server queueing (waiting line) model
49 CVP	Cost-volume-profit analysis
50 CONDPFOT	Conditional profit tables
51 OPTLOSS	Opportunity loss tables
52 FQJQOQ	Fixed quantity economic order quantity model
53 FQEOQWSH	As above but with shortages permitted
54 FQEOQPB	As above but with quantity price breaks
55 QUEUECB	Cost-benefit waiting line analysis
56 NCFANAL	Net cash-flow analysis for simple investment
57 PROFIND	Profitability index of a project
58 CAP1	Cap. Asset Pr. Model analysis of project

59 WACC	Weighted average cost of capital
60 COMBAL	True rate on loan with compensating bal. required
61 DISCBAL	True rate on discounted loan
62 MERGANAL	Merger analysis computations
63 FINRAT	Financial ratios for a firm
64 NPV	Net present value of project
65 PRINDLAS	Laspeyres price index
66 PRINDPA	Paasche price index
67 SEASIND	Constructs seasonal quantity indices for company
68 TIMETR	Time series analysis linear trend
69 TIMEOV	Time series analysis moving average trend
70 FUPRINF	Future price estimation with inflation
71 MAILPAC	Mailing list system
72 LETWRT	Letter writing system-links with MAILPAC
73 SORT3	Sorts list of names
74 LABEL1	Shipping label maker
75 LABEL2	Name label maker
76 BUSBJD	DOME business bookkeeping system
77 TIMECLCK	Computes weeks total hours from timeclock info.
78 ACCTPAY	In memory accounts payable system-storage permitted
79 INVOICE	Generate invoice on screen and print on printer
80 INVENT2	In memory inventory control system
81 TELDIR	Computerized telephone directory
82 TIMJAN	Time use analysis
83 ASSIGN	Use of assignment algorithm for optimal job assign.
84 ACCTREC	In memory accounts receivable system-storage ok
85 TERMSPAY	Compares 3 methods of repayment of loans
86 PAYNET	Computes gross pay required for given net
87 SELLPR	Computes selling price for given after tax amount
88 ARBCOMP	Arbitrage computations
89 DEPRSF	Sinking fund depreciation
90 UPSZONE	Finds UPS zones from zip code
91 ENVELOPE	Types envelope including return address
92 AUTOEXP	Automobile expense analysis
93 INSFILE	Insurance policy file
94 PAYROLL2	In memory payroll system
95 DILANAL	Dilution analysis
96 LOANAFDD	Loan amount a borrower can afford
97 RENTPRCH	Purchase price for rental property
98 SALELEAS	Sale-leaseback analysis
99 RRCONVBD	Investor's rate of return on convertible bond
100 PORTVAL9	Stock market portfolio storage-valuation program

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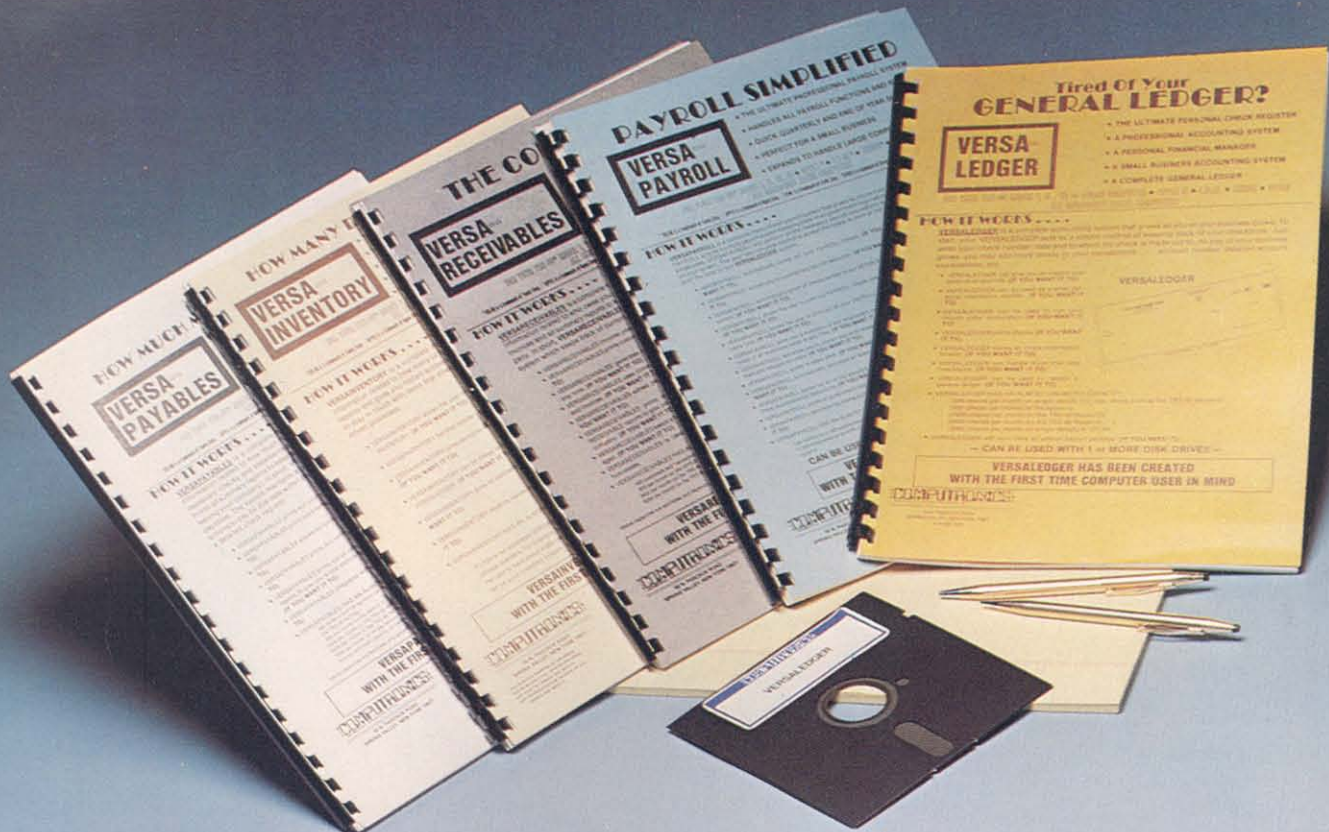
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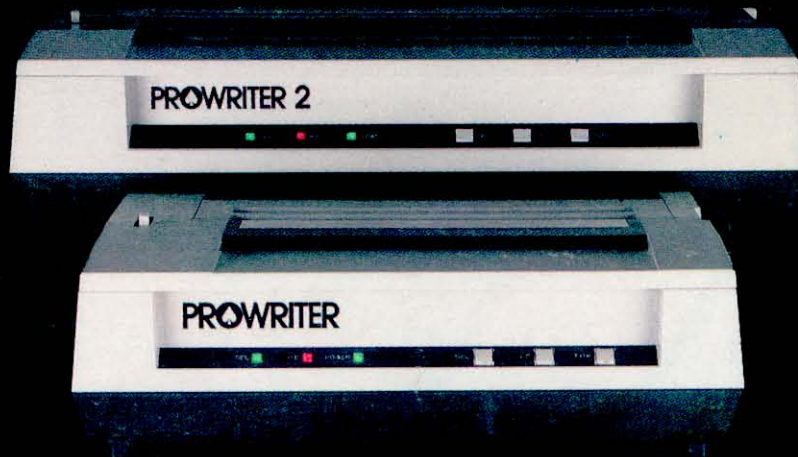
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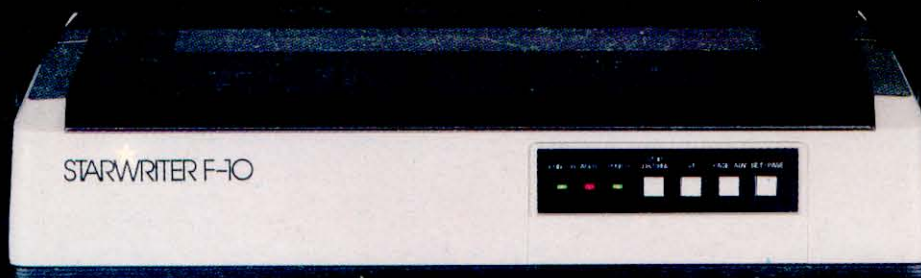
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