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THE ORIGINAL MAGAZINE FOR TRS-80™* OWNERS

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AUGUST 1982 **ISSUE NUMBER 48**

CONTENTS

FEATURES

10 Program Previews..... A. A. Wicks
This Month: Business Programs for TRS-80 Model I/III

11 IRS — Information Retrieval System ..... Peter Ansbacher
Keep track of your articles in computer magazines

24 Practical Business Programs..... S. M. Zimmerman and L. M. Conrad
The Transportation Method of Linear Programming

36 The Beale Treasure..... Gordon Speer
Decipher these and you can discover buried treasure!

45 I's, J's and their Relationship to Baseball..... C. Brian Honess
How you can work out the standings

53 Assembly Language for Beginners (Part 6)..... Joseph Rosenman
More about the CPU and the ALU

55 Program Conversion (Part VII)..... Richard Kaplan
More differences between the TRS-80 Models I, II, and III

58 The Versatile Peeker..... Friedhelm Hoehne
Understand memory addressing in the TRS-80

REGULAR DEPARTMENTS

2 Bits and Pieces ..... Howard Y. Gosman
Publisher's Remarks

4 The Crystal Ball
News and rumors of interest to TRS-80 owners

6 Letters to the Editor
Readers tell us what's on their minds

20 Color Computer Corner..... Joseph Rosenman
This Month: Diagnostics ROM, Ghost Gobbler, and Scepter of Kzirgla

30 Beginner's Corner..... Spencer Koenig
This Month: Lend an Ear to the Big Boys (Part 1)

40 Model III Corner..... Hubert S. Howe, Jr.
This Month: Cassette Input and Output

48 Pocket Computer Corner..... S. M. Zimmerman and L. M. Conrad
A Retail Package for the Pocket Computer

68 Advertising Directory

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BITS AND PIECES

Howard Y. Gosman

OUR FIFTH YEAR

We've hit ISSUE #48 of the COMPUTRONICS MAGAZINE and are ready to start our fifth year of publication. COMPUTRONICS is the oldest TRS-80 publication in existence. We hope that the cover of this month's magazine will help you to remember to RENEW YOUR SUBSCRIPTION NOW!!

RADIO SHACK read our article and published a release to all store managers stating that one of the TRS-80 publications out there had a "fuzzy crystal ball." Hence, our CRYSTAL BALL section. Our CRYSTAL BALL section has given advanced details about the TRS-80 COLOR COMPUTER, the MODEL II, double density disk drives from RADIO SHACK and many more items, months before the information was officially released. The popularity of the CRYSTAL BALL DEPARTMENT helped COMPUTRONICS survive its first year of publication. Starting with the next issue, COMPUTRONICS is happy to have back our original CRYSTAL BALL DEPARTMENT writer.

BASIC FOR BUSINESS

BASIC for Business is a new book by Alan J. Parker that is written for owners of the Models II and III, and anyone who uses their computer for their business can get a lot out of this book. This is an instructional book, which would be ideal either as a classroom text or a self-paced course on business programming. The objective of the book is to introduce the BASIC language through business problems which start at a simple level and are expanded to become more complex as you go through the book. All examples, exercises, and problems deal with business—payroll, inventory, customer statements, sales-

continued on page 8

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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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THE CRYSTAL BALL

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

One of the fastest growing areas in microcomputing, and one that will greatly influence our future lifestyles, is telecommunications. This month The Crystal Ball will review some of the new services available in this field.

Any subscriber to The Source network can now compose and send Mailgram messages directly from their personal computer. Messages can be sent anywhere in the United States, including Alaska and Hawaii. If entered in The Source by 4 pm, EST, they are virtually guaranteed to be delivered on the next business day.

The messages are forwarded by The Source to Western Union's largest Mailgram processing center. They are then routed by zip code to the serving post office nearest the adrw,02dressee, where they are printed, enveloped, and given preferential delivery treatment. Only senders and recipients are permitted to read the messages. The cost of sending Mailgram messages is billed to subscribers monthly, along with other charges from The Source.

To use the new service, subscribers simply sign on to The Source, then type MGRAM and are prompted step-by-step to enter names, addresses and messages. Once messages are composed, subscribers can review them on their terminal screens exactly as they will be reproduced as Mailgrams. Changes in the text can then be made, if necessary, before transmission. Subscribers may send one Mailgram message to a single address, or they can instruct that the same or different messages be sent to multiple addresses. Discount rates apply to quantity mailings of the same message. There is no limit to the number of Mailgram messages that may be sent.

Special features of the new service include: being able to receive one confirmation copy of the Mailgram message, or to receive duplicate copies that include the names and addresses of all messages sent; saving the message in a personal file on The Source for later reference; creating text files on The Source for frequently used messages, to facilitate their resending; arranging for the Mailgram message processing service to enter names and addresses from large lists, at a cost of $.35 each; and storing lengthy address files with the message processing service at a nominal charge.

The rate for sending a single Mailgram message is $5.15 for messages up to 100 words, with an additional $1.00 for each additional 100 words. The cost of confirmation copies, which are delivered at the same time as the messages, are $2.00 each with $1.00 for each additional 100 words. These costs are in addition to standard usage fees for The Source.

General Videotex is offering a package called Delphi, that presently provides an on-line encyclopedia and at-home banking, and will include a check balancing service, on-line games, access to travel reservations and a shop-at-home service in the future. The Encyclopedia is called a "universal on-line reference work" with more than 24,000 entries that are updated by a full time staff of 14 editors and augmented by articles from the UPI wire services. Users can access entries by means of keyword searches. The bank-at-home services can be accessed by users with a local phone call, either through the Tymnet network, or a local private network that General Videotex has set up in several major cities, including Atlanta, Chicago, Los Angeles, San Francisco, Washington D.C., and New York.

Charles Mann & Associates of Yucca Valley, California, is offering a service that will give diagnoses of computer problems over the phone. The firm's technical services facility will allow either voice access to technical personnel or direct connection to a custom-designed minicomputer that will automatically diagnose operating problems and give remedial service or instruction. Once logged on, the user will answer a set of simple questions about the configuration of his system and about the problem. Then the minicomputer can run hardware tests,

A Sweet Deal...

Buy an Alpha Joystick and games together and deduct up to $14.00 from your order.

(Model I version shown)

The Alpha Joystick adds arcade-style control to TRS-80 action games. Simply plug it in and begin playing joystick compatible games. No modification, wiring or batteries are required, and the Alpha Joystick is compatible with other TRS-80 accessories. The instructions are clear and complete. We even show how easy it is to experiment in BASIC (A=INP(0) reads stick) and convert BASIC programs to Joystick control.

MODEL I - Plugs directly into any Level II Keyboard (card edge on rear) or expansion interface (left side, next to printer port).

MODEL III - Works with any 'Model III BASIC' system and plugs into the 50 pin I/O bus (largest edge connector underneath).

THE ALPHA JOYSTICK

Joystick + 1 game Deduct $ 6.00
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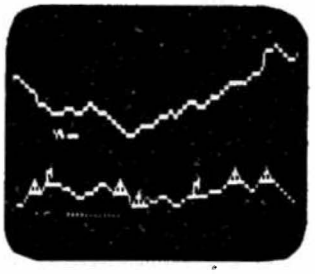
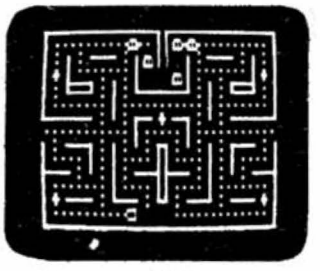
Choose from any of the Joystick Compatible games below. Be sure to mention the "Sweet Deal" discount when ordering.



PENETRATOR

Soar swiftly over jagged landscape, swooping high and low to avoid obstacles and enemy missile attacks. With miles of wild terrain and tunnels to penetrate, you're well armed with bombs and multiple forward missile capability. From Melbourne House. Features sound, trainer mode and customizing program.



• • SCARFMAN

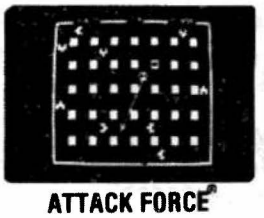
This incredibly popular game craze now runs on your TRS-80! It's eat or be eaten. You control Scarfman around the maze, gobbling up everything in your path. Try to eat it all before nasty monsters devour you. Excellent high speed machine language action game from the Cornsoft Group. With sound.

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 that saucer with the laser! As reviewed in May 1981 Byte Magazine.

LUNAR LANDER

As a vast panorama moonscape scrolls by, select one of many landing sights. The more perilous the spot, the more points scored — if you can land safely. You control LEM main engines and side thrusters. Absolutely the best use of TRS-80 graphics we have ever seen! From Adventure International. With sound.

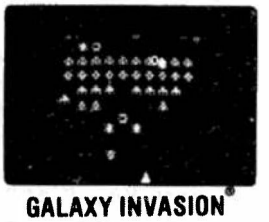


ATTACK FORCE®

As your ship appears on the bottom of the maze, eight alien ships appear on the top, all traveling directly at you! You move toward them and fire missiles. But the more aliens you destroy, the faster the remaining ones become. If you get too good you must endure the "Flagship". With sound effects!

COSMIC FIGHTER®

Your ship comes out of hyperspace under a convoy of aliens. You destroy every one. But another set appears. These seem more intelligent. You eliminate them, too. Your fuel supply is diminishing. You must destroy two more sets before you can dock. The space station is now on your scanner. With sound!

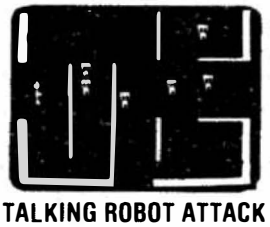


GALAXY INVASION®

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 formation and fly straight at you! You place your finger on the fire button knowing that this shot must connect! With sound effects!

DEFENSE COMMAND

The invaders are back! Alone, you defend the all important nuclear fuel canisters from thieving aliens who attack repeatedly. An alien passes your guard, snatches up a canister and flys straight off. Quick! You have one last chance to blast him out of the sky! With sound and voice.



TALKING ROBOT ATTACK

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

ARMORED PATROL

A realistic tank battle simulation. Your view is a 3—D perspective of an alien landscape. Maneuver your T-36 tank to locate and destroy enemy tanks and robots that lay hidden, ready to assault you. Clever graphics create the illusion of movement and dimension. From Adventure International. With sound.

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media tests, and byte-by-byte tests on program copies, and can also make program changes, run file-update programs, and retreive destroyed files. If the computer cannot solve the problem, then it will automatically notify a service technician who will try to help.

The International Software Directory is now available on-line from Lockheed's Dialog data base. The directory has over 7000 entries describing software packages for microcomputers, and allows full searching facilities by type of computer, operating system, subject, vendor, or price, as well as full text searching for keywords. Access to the system will costs about $60 per hour, but the directory's publisher, Imprint Editions, says that most searches will only take two to three minutes. The Dialog data base can be accessed by several means, including the Telenet and Tymnet systems. Any individual entry can be printed and mailed to the user for 15 cents, and a printed version of the entire directory costs $39.95. ■

LETTERS TO THE EDITOR

Error in Pocket Program

Please be advised of an error in your *Computronics* magazine, May 1982, page 48, in the "Pocket Computer Corner.% As written, line 20 will never be used. The program works fine with the following insertion:

2: IF X=2 GOTO 20

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Also, in the same program, line 60 should start:

60 E=INT(---

instead of:

60 E-INT(---

Thank you.

James Parsons
Parsons Electronic Services
3113 Edgewood Drive
San Angelo, TX 76903

Corrections to "Metric Conversions"

I have just received my copy of the June *Computronics* and am very pleased with the article and the program. In proofreading the program, I found only two cosmetic errors and one typographical errors, as follows:

Line 620: Remove 14 spaces between (CU CM) and (TO CU FT); should line up with lines 610 and 630.

Line 1020: Remove one space between (GRAM) and (TO OZ AVDP); should line up with line 1010 and 1030.

Line 1310: C=0.7703 should be changed to C=0.0703.

In closing, thank you for the professional way you have composed and set this article, as well as all the other articles. I say again *Computronics* is the best.

Jack S. Willett
14089 Buckner Drive
San Jose, CA 95127

Installing your own RAM

I hope that you can help me! I recently bought 32K of additional RAM memory for my Model III from a non-Radio Shack distributor.

It works okay, except that I still can't PEEK or POKE above the old 16K address of 32767. The distributor just ignores me, so I am hoping that you can find the solution for me.

Ken Taylor
c/o Canyon Research Group, Inc.
741 Lakefield Road, Suite B
Westlake Village, CA 91361

If the RAM is working properly, your computer should show greater memory when you PRINT MEM in BASIC. If you now have 48K, the value you get should be 48082 in non-Disk Basic and 38200 in Disk Basic.

Perhaps the reason you are getting the problem is that you are not supposed to use the values above 32767 for POKE and PEEK operations; instead, the numbers 0 to -32767 are used for these locations. If you can POKE or PEEK into negative locations, then your RAM is all right.

Error in Phone Number

Thanks for the kudos for the LemonAid Loader in the June issue. Somebody, however, transposed the last two numbers of my phone number in the column. It's correct in our ad. An acquaintance of mine across town could have been a mite perplexed, if I hadn't warned him, when he started getting calls about — of all things — a LemonAid Loader???

Our number is (417) 345-7643, and we can be reached almost any time from 8 A.M. to 10 P.M., Monday through Saturday, for questions, orders, or both.

Wayne Lemons
Lemons Technical Services
325 N. Hwy 65
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Power-up Procedure

On page 54 of your February '82 column, you write, "<errors>...could be caused by opening the disk drive door when turning power on or off. The diskette must not be left in the drive when power is turned on..."

It occurs to me that perhaps all of us would benefit if you would go through the whole power up and power down sequence in a step-by-step manner for us. More specifically, I'd appreciate the correct procedure on power up for at least the following steps:

(1) Turn on all peripherals: video, printer, disk drives, Expansion Interface, etc.
(2) Turn on keyboard
(3) Insert system disk
(4) Close drive door
(5) Push RESET

And what is the best order on power down?

I've eliminated a lot of system crashes and strange events by putting individual power line filters on each piece of equipment where possible, except the video, which I plug directly to the wall outlet. Also once I'm powered up, I avoid flipping any intrasystem switches. For example, even though I think I plan not to use my modem during a given session, I nevertheless turn on its power module, just in case, BEFORE powering up my drives and keyboard.

Andy Chakires
1704 Miramar
Los Angeles CA 90026

We would recommend the following power-up sequence for the TRS-80 Model 1. First, it is best if you get a power strip with an on/off switch, so that the Model 1 power supplies are not left on all the time. This causes heat to build up, which can damage or burn out the unit. (In fact, you should not leave the power supplies inside the Expansion Interface, as Radio Shack recommends, for the same reason.) The strip sold by Radio Shack is excellent for this purpose, because it also contains small power-line filters.

If you have all items plugged into the power strip, you do not need to turn on each unit separately when powering up. Leave the Expansion Interface and keyboard off, and remove any disks in the drives. (Actually, it is sufficient simply to open the drive doors; you can leave the disks in the units if you want to.) Turn on the power to the Interface first, then to the keyboard. After the disk light goes off (it should go on when the power is turned on), insert the system disk, CAREFULLY close the door, and press the RESET button. That should do it.

Radio Shack's Repair Policies

I have just received my May copy of *Computronics*. Mr. Robert Forman's letter about Radio Shack's repair policies (?) echoes my sentiments exactly. I have had several similar experiences with Radio Shack's callous indifference to requests for repair service. My experience also indicates that Radio Shack's people on their "Hot Line" in Texas forget you as soon as they hang up the phone.

I have tried to make my displeasure known to Radio Shack. Writing letters to Mr. Jon Shirley are a waste of time. Apparently, Mr. Shirley only reads and answers letters that are printed in your magazine.

In my case the last straw occurred in December 1981. Radio Shack took nine weeks to repair a Model IV printer that had stopped underlining! I needed a printer for my bookkeeping and tax programs. Unfortunately, I made the mistake of buying a Model VIII. While trying to run my Income Tax programs, I found that the Model VIII would not execute a full reverse line feed. Several calls to Texas resulted in the statement, "Yes we know that the Model VIII does not reverse line feed. Try two half reverse line feeds." They also promised that they were working on a fix and that they would call back when they had it. Needless to say, it has been four and a half months and they have not called.

In my case I did not try for the second round of Radio Shack's repair service by going to a Model III. In January 1982 I became the proud owner of a new IBM PC. The Personal Computer is a great improvement over my old Model I, and it appears to be a great improvement over the Model III also. I have converted all of my bookkeeping and income tax programs to the IBM, and they work fine. The monochrome screen is excellent, and gives no eye strain after hours of use.

Incidentally, I am writing this letter using your Super Text Editor. I have converted it to the IBM.

Thomas McLuckie
Mazon, IL 60444

We don't think that there is any excuse for Radio Shack's repair policies, but we would like to comment on your comparison of the Model I to the IBM PC. Undoubtedly the IBM is a much finer computer, but don't forget that the Model I TRS-80 was designed in 1977 (the IBM PC was designed in 1981), and that the Model I cost about half the price of the IBM.

Cassette Merge

I enjoy your magazine and await it monthly with bated breath. I would like to see you label the programs as to

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- Prints on envelopes or on labels, 1, 2, 3 or 4 across.
- Test label/envelope printing lets you make adjustments with ease.
- Master printout of your list in several formats.
- Selective printing by specific zips or by zip range.
- Editing is simple and fast...automatic search. Batch transfer of edited entries to backup disks.
- Provides for duplicate labels.
- Deleted entries have "holes" on disk filled automatically.
- Automatic "repeat" feature.
- Load and "scroll" through entries.
- Optional "ATTN:" line.
- Plenty of user defined fields with various options for **simultaneously** purging and selecting the printout.
- All Ø's in address labels are replace by easier to read 0's.
- Continuous display of numbers of labels/envelopes printed.
- Each disk entry automatically "remembers" how many mailings have been made.
- Primarily written in BASIC for **easy modification**...embedded machine code for those speed sensitive areas.
- Hardware requirements: 32K, printer, and 1 or 2 drives.

Precision Prototypes
410-F East Roca
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whether they are for Model I, II, or III.

Finally, Is there a MERGE program out there for a Mod III cassette computer? In fact I have enclosed a SASE just in case someone there has one hidden away for a Mod III, 48K. If not, maybe you can find a little corner in your magazine and print my request with my address. Also if anyone would be interested in exchanging any programs (FREE, of course).

Thanks for your time and again, thanks for a great magazine.

William O. Byberg
7 Tiffany Road A9
Salem, NH 03079

We do not know of any MERGE program for cassette systems, for any model TRS-80 computer. If anyone reading this space knows of one, please let us know and we will pass on the information to our readers.

Mod III Assembly Language

Dear Dr. Howe,

I just finished your book, TRS-80 ASSEMBLY LANGUAGE, which I really enjoyed, especially the sections on disk processing. I have a Model III with two disk drives and I am not sure what information from chapters 16 and 17 is applicable to the Model III and what is not. I would like to know if you have update information for the Model III available or if you could steer me to a source for the information. I have put off buying Pennington's Disk book because I believe that it is still geared towards the Model I.

Eric B. Klein
505 Lausanne Drive
Greensboro, NC 27410

Dr. Howe replies:
I have completed a new assembly language book for Prentice-Hall specifically directed to the Model III. The information about the disk in the previous book concerns only the Model I and has no application to the Model III, although some of the workings of the disk operating system are similar. There are also updates for the ROM and RAM, RS-232-C interface and other aspects. Although the book is now completed, it will not be available from the publisher until about December.

Optical Reader

I am attempting to interface an IBM 1230 Optical Reader to a TRS-80 Model II. I would appreciate hearing from anyone who has or intends to do the same.

Louis M. Ferrari
3919 Octave Drive
Jacksonville, FL 32211

H & E Computronics welcomes letters on any subject. If you wish a personal reply, please enclose a self-addressed, stamped envelope.

H & E Computronics also welcomes readers to submit programs, articles, or reviews for publication. Please address correspondence to:

The Editor
H & E Computronics
50 North Pascack Road
Spring Valley, NY 10977

Please submit programs (and articles, if prepared on a word processor) on media (cassettes or diskettes). Also please indicate the system it was prepared on, and include any necessary instructions. ■

BITS AND PIECES

continued from page 2

men's commissions, etc. It is assumed that the reader has some basic knowledge of business transactions, but a background in computers or mathematics is not required. File handling is covered extensively in this book, and this is one area that often mystifies and intimidates new users. Each chapter clearly states its objectives, then presents background information, program routines that illustrate various methods of accomplishing the task being described, and finally problems for the user to solve. Although I haven't had the chance to read the entire book, from what I've seen, the writing style seems clear and easy to understand, and the way that the information is presented is very professional. This author doesn't just know his way around the computer, he obviously is a very good teacher as well. Chapters in the book are: Performing Simple Calculations, Data Entry, Sequential Files, Writing Reports from Sequential Files, Adding and Deleting Records, Updating Sequential Files, Using Lists and Tables, Using Lists and Tables, Using Direct Access Files, Use and Design of Complex Programs (including structured programming), an appendix on BASIC commands, error messages, sorting, etc., and an index. This book is not just for the novice programmer. An experienced programmer could open the book at any point and find many good ideas inside.

INTERFACE FOR VIDEODISC PLAYERS

The DiscMaster 1000 is a serial interface that will let you control a videodisc player through any small computer. This doesn't mean just turning it on and off at particular times (which most of the players can do by themselves anyway). This device will let you completely control the sequence of playback, which will open up a whole new world for programmers of games, simulations, and a vast range of data retrieval applications. It may sound like a novelty that won't last, but within a few years, this technology will be seen *everywhere*. By nature the videodisc is perfect for random-access retrieval, just like magnetic computer discs. The difference is that the videodisc stores images rather than data, and any single frame (picture) can be retrieved in seconds. In addition, a moving sequence of pictures can be made to branch just like a program does, allowing a wide range of graphic simulations, but with *real* pictures on the screen, not computer graphics. Users can write, debug, and repeatedly modify their videodisc application programs in whatever higher level language their computer supports (including BASIC, FORTRAN, PASCAL, etc.). The DiscMaster 1000 is controlled by sending single character mnemonic command codes to the interface, such as "S" for search, "P" for play, etc. The only difficulty is that videodisc players do not record, and creating your own videodisc is still an expensive prospect. The DiscMmaster costs $395, and those interested should contact New Media Graphics, 139 Main Street, Cambridge, MA 02142, (617)-547-4344.

POCKET COMPUTER SOFTWARE

Sound Software Systems (P.O. Box 1365, Renton, WA 98057) offers a variety of software for the Radio Shack-Sharp Pocket Computer. Programs are organized in groups of five (called "Pacs%) and are available on cassette or listing only, with complete documentation and instructions. Written in BASIC, these program Pacs are easily adapted to most other pocket and micro-computers. The software is geared primarily to engineering and business applications with many of the programs unique among pocket computer software. Free information is available on request. Dealer inquiries are welcomed.

MODEL I MUSIC SYNTHESIZER

A new software-only music synthesizer is now available for the Mod I. This program goes beyond the simple music programs previously offered by simulating many features found only on hardware synthesizers, including: white noise, variable frequency cutoff, pink noise, frequency and pulse with modulation, variable duty cycle, white noise superimposed on square wave, and full variable glissando. The program also has limited ability to produce two tones at once.

The operating system has a 300 note buffer with full edit capabilities (copy, insert, delete, change, examine, and make a progression of notes). The operating system also has full error trapping and many prompts for ease of operation. Detailed documentation with many examples is included. The synthesizer package is available for $24.95 from K & K Computer Peripherals, Box 88203, Kentwood, MI 49508.

COLOR COMPUTER BULLETIN BOARD

CONNECTION-80 has celebrated its first birthday, and in one year of operation has logged over 15,000 callers. This bulletin board is dedicated to owners of the COLOR COMPUTER, and is can be accessed at no charge simply by calling 212-441-3755, 24 hours a day. The BBS has over 2.6 megabytes of disk storage, download facilities, a bulletin section, merchandise section, chat section, and electronic mail. Of course, one of the best features is that it's *free*. That's hard to beat nowadays!

POCKET COMPUTER GAMES

Radio Shack is now offering a collection of eight game programs for the POCKET COMPUTER. Two cassettes, costing $14.95, contain Missile Marksman, Baccarat, Blackjack, Aceydeucey, One-armed Bandit, Pokerslot, Numguess, and Craps. Instructional manuals for each game are included.

DISASSEMBLED HANDBOOK #5

Volume 5 of the Disassembled Handbook series, entitled "Advanced Baudot Radio Teletype for the Model I and Model III TRS-80 Microcomputers" is now available. It is for both the novice programmer and the experienced assembly language programmer. The novice simply loads the 11,000 byte assembly language program from the disk which is included, then a BASIC loader program is run which asks the user nine questions, including: Amateur radio call letters, type of ham equipment used, type of antenna used, handle (name), full address, and so forth. This BASIC program then modifies the assembly language program and allows you to dump the customized program to disk as a /CMD program. It takes only about 10 minutes to customize the program, and, once done, it need not be done again unless the user changes some aspect of the setup. There are a number of interesting features, such as editing the received message using commands similar to the Electric Pencil, receiving a message at one speed and retransmitting it at another speed, and type-ahead in both transmit and receive modes at any speed. The program includes its own keyboard decoding subroutine so the program operates *identically* on both the Model I & III. The book and disk cost $49, and the book may be bought separately for $20 (assembly language programmers may wish to key in the entire program themselves, or make alterations in the code, so the complete listing is included in the book). Volume 5 may be purchased directly from H & E Computronics. ■

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PROGRAM PREVIEWS

A. A. Wicks

This Month: Business Programs for TRS-80 Model I/III

Radio Shack has published another book under their aegis that was previously released under a different name by the publisher. This book, "Business Programs for TRS-80 Model I/III," was earlier issued by the Hayden Book Co., Inc. — who are once again the publishers. The previous title for the almost identical book was "BASIC Computer Programs for Business."

The title of the current release is somewhat deceptive - once past the front cover and the frontispiece, the names "Model I" and "Model III" never reappear. For that matter, neither does the name "Radio Shack." What does appear, however, in the first Appendix, is: "All programs in this book were developed, tested, and run on an Altair 8800b Microcomputer System operating under Altair's Revision 4.1 of their Disk Extended BASIC."

Some concession has been made in some of the programs in providing "LPRINT" for use on the Radio Shack computers. This has not been carried far enough though, and many of the programs that have only "PRINT" will need changing to gain printed copies of the computed results of the programs. The pattern of what has been "LPRINTed" and those that have not, is not clear — it is as if someone made an arbitrary or random judgment.

I think, however, that most readers could probably cope with that problem if they are going to be typing in programs from this book. The more serious flaw is in the treatment of disk-related program statements. This is going to require a good knowledge of disk-based operations to translate from what is ostensibly Altair Disk BASIC to Radio Shack Disk BASIC. For instance, the previously referenced Appendix advises that Altair BASIC requires random-file records to be 128 characters long. A smaller record size will be accepted, but disk utilization remains at 128 characters.

There are other discrepancies, such as "OK" used instead of "READY." For some reason, not all of the pages are numbered, which may indicate that many of the text pages were printed from the original plates. Also, some of the formatted printout examples that do not use the LPRINT expression exceed the video screen character-width, therefore, the display would move to the next line and spoil the format. Of course, if one were to make the PRINT an LPRINT this would not be a problem, at least not on paper. The Model I/III user will find syntax problems in situations where LPRINT is used; the expression "LPRINT TAB(20); "XXX"" appears in the program listings. We also have the unusual situation of an example printout, which states: "Align to Top-of-Page and press the return," but the program statement for this output reads, "Align ... and press the Enter key."

As none of these peculiarities (at least they will be that to an uninformed TRS-80 user), are mentioned or explained in the book, the user may be in for some surprises. But so much for the criticisms.

A detailed review of the many programs in this book ("over 35"), is beyond the scope of a monthly column - there are just too many. Nevertheless, some of the more pertinent should at least be mentioned. The book is divided into three Sections providing seven Groups — Bookkeeping (though that word disappeared with the high stool!), Accounts Receivable, Financial (General), Perpetual Inventory, Periodic Inventory, Inventory (General), and Production. Within each Group there are many individual programs. For instance, under Bookkeeping there are programs for Journal Entries, Trial Balance, Income, Balance Sheet, etc. The Financial Group includes, Breakeven Analysis, Cash Flow and Budget, Least Squares Regression Forecasting, Depreciation, Amortization, and so on (for a total of 21 programs in this Group, alone). The Inventory Groups are complete - covering just about every inventory type and transaction that may be envisaged for any business situation. The Production Planning and Control programs include Job Costing, Bill of Materials, Cost Computation, Production Alternatives, etc.

For any business willing to do a great amount of keystroking, there are enough programs in this book to represent hundreds of dollars of purchased programs. There is also a wealth of learning here for anyone who wishes to analyze these programs for their own programming education and modification. If you can cope with the deficiencies previously stated, perhaps this book may be of interest and benefit.

The layout of this text is excellent — as are the choice of programs. The author-programmer, Charles D. Sternberg is undoubtedly skilled in his profession, as this and his previous publications will attest. Each program listing has a brief summary of what the program does, what it comprises, and what might be expected of it. There is also a tabular listing of all string arrays, called "Major Symbol Table," with a brief description of the string function, and a Table of Functions used in the program, e.g., Gosub, Return, Dim. There are no lower-case listings or printouts, but there is no reason that lower case entries could not be used where desired.

Production of this book is in the usual first-class Hayden style — crisp, clean, good quality paper stock, with clear typefaces — although all programs and sample printouts are by dot-matrix printer. For the price, the book is a good value — but do keep in mind the problems that have been mentioned, in making a decision to purchase.

Business Programs for TRS-80 Model I/III. Radio Shack Catalog No. 62-2079, $8.95 .■

IRS — INFORMATION RETRIEVAL SYSTEM

Peter Ansbacher

Abstract

This system contains four separate programs that are designed to run on a Radio Shack TRS-80 Model I computer with at least one disk drive and 48K of memory. There is a section devoted to modifying the routines so they can run in 32K of memory. This system is oriented towards maintaining information about articles in magazines. It describes a method requiring a minimum effort to enter the data, a program to produce a keyword listing, a program to sort the data, a program to merge files that are already sorted, and a program to list the data. Each of the programs are separate stand-alone BASIC programs. They may be used together as a package or they may be used separately. In particular, the SORT, LIST, and MERGE programs are extremely useful just by themselves. The KEYWORD program merely takes the user input and creates an output file that can be processed by the SORT and LIST programs.

Introduction

How do you keep track of all the articles you read in the different computer magazines each month? One way is to read each magazine when you get it and hope that you can find the article later when you want it. Another way is to enter enough information about each article into the computer and search the entire file for all articles on a particular subject. Both of these methods have advantages and disadvantages. The advantage of the first way is that it requires a minimum amount of effort. The disadvantage is that it takes a long time to find the article if you have to search through several magazines. The advantage of the second way is that all the information is stored in the computer for future retrieval in almost any fashion. The disadvantage is that you must use the computer to retireve the information. I would like to propose an alternate method that combines the best features of these two methods.

First of all, I assume that you want to use the computer help you find the information in the different magazines. Second, the effort to enter the data must be kept at a minimum. And third, the printout must provide all the information you need. The steps involved are as follows:

(1) As you read each magazine, you write down the page number of the article, a description of the article, and as many key word phrases associated with the article as you wish.

(2) You enter this data into the computer.

(3) You run the KEYWORD program to produce a file that can be sorted by description and keywords.

(4) You run the SORT program to sort the file.

(5) You run the LIST program to list the file. The printout contains a listing of all descriptions and keyword phrases of all the articles read.

Now when you want to find an article on a particular subject you find it listed under the particular keyword. The main advantage of this system is the ease of use of the printout to find the desired information. It does not take any computer time to retrieve the information. The disadvantage of this system is the time to print the file. However, this time can be reduced by storing articles only from one magazine in each file. If you desire to have one big printout, then use the MERGE program that will let you merge all the files together so that they can be printed in one listing.

How These Programs Came to be Written

I subscribe to several computer magazines. I wanted a way to be able to find an article quickly. I decided that I wanted an alphabetical listing of all the articles I read. This list had to contain a description of the article and keywords. If at some time I wanted to find an article that dealt with "printers", then I wanted that article listed under "printers". Since the list had to be printed, I needed a list program. The disk operating system has a command to print a file on the line printer, but I wanted the output to look neater. Since the list had to be sorted, I needed a sort program. I knew an in-core sort routine in BASIC would be slow but then I found a machine language sort routine that ran quickly. I also knew that all my data would not fit in core so I settled for sorting parts of it and then merging the sorted parts.

Finally, I had to devise a method of inputting the data with the least effort. I realized that in one magazine issue there are several articles. This meant that the reference would have to be repeated several times. I wanted to enter the reference once and then enter all the articles after it. The program would have to append the reference onto each article. Also since an article may have several keywords, the program would have to generate a separate output line for each input keyword. This is all done by the KEYWORD program.

I started out by looking very carefully at what I wanted the end result to be. Then I worked backwards to how the data should be put into the computer in the easiest form. I have found this approach to computer projects very useful.

The Four Programs

I will refer to the four programs by the following names: KEYWORD, SORT, MERGE, and LIST. The KEYWORD program reads data from one file and creates another file. For each input line, it will create one or more output lines. The format of the input data and output data is described later. The SORT program reads a file into memory, sorts it in memory, then writes the sorted data out to another file. The sort time is very short. The MERGE program will merge 2 to 14 sorted files into one file. The LIST program will print a file on the line printer with page numbering, page titling, and will print lines that are longer than 80 characters.

How to Enter the Data

The data is entered into the computer using the built-in

editor that comes with the TRS-80 computer. This built-in editor consists of the AUTO command that lets you enter successive lines of data, the EDIT command to make changes to the data, the SAVE command to save the file on disk, and the LOAD command to get a file from disk. Together these commands allow you to enter data into the computer and save it on disk. The only restriction is that each line you enter must start with a single quote followed by a space. The single quote is the abbreviation for the REMARK statement. In other words, the data you enter is actually a BASIC program that consists only of REMARK statements.

For those of you who have SCRIPSIT or ELECTRIC PENCIL or another text editor, you may create a file without line numbers and remarks. The KEYWORD program will accept data in either form.

Format of the Input Data

The KEYWORD program is the most complex program of the four programs in the system. It reads data from a file and creates what I call a keyword file. This keyword file is just a rearrangement of the input file. Each input line generates one or more output lines depending on how many keywords it has.

There are three types of lines in the input file. They are called Reference lines, Item lines, and Comment lines. The entire input file consists of several Reference lines, each followed by its set of associated Item lines. Comment lines may appear anywhere.

The input file consists of a series of references. These references are the name and publication date of the magazine. For example, "HE-1/81-" could stand for the H & E Computronics, January 1981 issue. Following each Reference line is one or more lines containing each item of interest. There can be any number of Item lines for each Reference line.

There are also Comment lines. These lines may appear anywhere in the input file. When they are read by the KEYWORD program, they are ignored and not processed at all. They can be used to insert comments or descriptive information in the file. They can be used to fully identify the file. They can also be used before and after each Reference line to make it stand out.

The three types of lines are distinguished from each other as follows:

Comment lines start with two periods.
Reference lines start with one period.
Item lines start with a page number.

Here are some examples of Reference lines and what they might stand for:

```
.HE-1/81-       H&E Computronics, 1/81
.KB-3/79-       Kilobaud Microcomputing, 3/79
.CC-2/81-       Creative Computing, 2/81
.FILE           Entries from the file drawer
.CARD           Entries from a card catalog
```

Notice that each start with a period and most end with a dash. The reason they end with a dash is because the page number will be appended to the reference. For example, you might end up with HE-1/81-24. In the case of the last two, you do not need a dash and you can omit the page number on the Item lines. However, if you do omit the page number, remember to still use the semi-colon at the start of the line.

Each Item line contains two or more fields. Each field is separated from the next by a semi-colon. The first field is the page number. The second field is the item or description of the article. The remaining fields are keywords. The general form is:

Page; Item; Keyword1; Keyword2; ...

Here are some examples:

1; Disk operating systems, a comparison of; TRSDOS; NEWDOS; VTOS

15; How to increase speed of SCRIPSIT; SCRIPSIT

The second field or Item may be omitted if you like. If this is the case then just put a blank character between the first two semi-colons. For example:

11; ; Scripsit; Electric Pencil; Easy Writer

Even the page number can be omitted. You might want to omit it in the case of several items from your card index file or from your file drawer. Since the page number has no significance in these cases, it may be left off. But the semi-colon must still be used to start the line. For example:

.CARD
; catalog of software and hardware items; hardware; software

When we put it all together the input file might look like this:

```
.. H&E and file information
.. Last updated 3/1/81
..
.HE-2/81-
..
12; DOS comparisons; TRSDOS; NEWDOS/80; VTOS
22; Star Trek game, $19; game
..
.HE-3/81-
..
3; sorting methods compared; bubble; shell; GSF
15; disk drives, double density, $400; Percom
18; ; Scripsit; Electric Pencil; Easy Writer
..
.FILE
..
; catalog of hardware and software; hardware; software
; microsoft basic compiler, $195
```

The following is a summary of what the output file will look like given a general form of the input file. In the following, "R" is the Reference, "P" is the page number, and "KW1" and "KW2" are the keywords. "Item" is the item or description of the article.

```
Input File              Output File
----------              -----------
.R-
P; Item                 Item; R-P

P; Item; KW1            Item; KW1; R-P
                        KW1; Item; R-P

P; Item; KW1; KW2       Item; KW1; KW2; R-P
                        KW1; Item; R-P
                        KW2; Item; R-P

P; ; KW1; KW2           KW1; ; R-P
                        KW2; ; R-P
```

The input file to the KEYWORD program must be an ASCII file. This can be created by saving it with the "A" option. For example, you can use SAVE"DATA1",A. The KEYWORD program also expects to find a blank after every semi-colon in every line. This will also add to the readability of the data. If a blank does not follow each semi-colon, the program will not work properly at line 680. The program also expects a valid line every time. It must be able to find at least one semi-colon in each Item line or else it will stop at line 630 with an Illegal Function Call error.

Description of the KEYWORD Program

The KEYWORD program reads a disk file and creates another disk file with the data rearranged. One input line will generate one or more output lines. If the input line contains only the item, then there will be only one output line. If the input line contains an item and two keyword phrases, then there will be three output lines. The output file will contain as many lines as there are items and keyword phrases in the input file.

In addition to describing what the different statements do, I will also talk a little about how they are representative of good programming. By the way, the single quote is the start of a remark statement.

Lines 10-70 describe the program name, purpose, author, and copyright information. It is good practice to include these statements at the beginning of all programs. The variables are listed in alphabetical order in lines 90 to 230. The reader can see briefly what each variable will be used for.

The CLEAR 1000 instruction sets aside 1000 bytes for string usage. This program does not use a lot of string space. Line 260 initializes the counter for the number of lines in the output file.

Line 270 clears the screen. Lines 280 to 310 print the name of the program and what it does. This is a nice feature since it will inform the user that he is running the proper program. Lines 320-330 prompt you for the input file name. Line 340 opens the file for input. Lines 350-400 prompt you for the type of input file. If the file was created using the BASIC editor, then reply with "Y". If the file was created with SCRIPSIT or ELECTRIC PENCIL or another text editor, then reply with "N". Additional PRINT statements are used for double spacing. This makes the information on the CRT easier to read. The use of the word FILESPEC was chosen because Radio Shack refers to FILESPEC throughout their documentation. Perhaps a more universal phrase would be FILE NAME. In lines 340 and 440 there are spaces after each comma. This makes the statement easier to read than if it were written with no blank spaces.

In order to prevent reading past the end of file on the input file, line 460 checks for that condition. If the end of file has been reached, then control is transferred to the end of the program at line 850 where both files are closed in line 850 and the total number of lines in the output file is printed in line 870. This last message is not necessary but does indicate that the program has come to a normal end and lets the user know how many lines there are in the output file. Also, the file name is printed since it will be used by the next program in this series, the SORT program. Of course, all good things must come to an end and so does this program in line 880.

I would like to make a general comment here about good programming practices. I use blank spaces in statements to make them more readable. I add remarks at the end of lines to describe what they do. I add blank remark lines between groups of related statements. I put only one statement on a line unless it is actually logically more clear to put more statements on one line. I try to not let any statement be longer then 64 characters so it can be viewed more easily on the CRT. I know that some people like to write programs that are efficient for the computer. These programs are generally difficult to read. If you want to have a very efficient program, then I suggest that you compact your program using one of the many compacting programs available on the market. Then you can keep the original listing that is easy to read.

Now back to the program in line 470. This line gets the next line of data from the input file. Line 480 skips over any null lines. SCRIPSIT sometimes creates null lines when a file is saved on disk. Line 510 will strip off the leading characters of each line if the file was created by the BASIC editor. These leading characters are the statement number and the single quote remark character. Line 510 has two parts to it. First I find the single quote with the function INSTR(1, A$, "'") which will return the location in string A$, starting at location 1, where the first quote mark is found. I add 1 to it so I can get the first character of possible valid data. The second part of line 510 strips off the line number and single quote by setting string A$ to that part of A$ that starts with the first character after the single quote. Now A$ contains good data. But first I must strip off any leading blanks. This is done in line 530. If the first character is a blank, then line 530 will strip it off and go back for another look at the first character. The LEFT$(A$, 1) function returns the leftmost 1 character in string A$. The MID$(A$, 2) returns a string of characters from string A$, starting with the second character and ending with the last character in the string.

Now that we have a line of data to process, we start processing it. Line 540 checks for comments and if they are found they are ignored and we go back to get the next line of data from the input file. Line 550 calculates the length of A$. I use a separate variable for the length since it will be used several times in the following lines. Line 560 checks for a reference. Line 570 gets the reference. The RIGHT$(A$, L-1) function returns the rightmost L-1 characters in A$. Line 580 removes leading blanks from the reference. Lines 590-600 print the reference on the output file and on the CRT. Since there is nothing else on a reference line, we go back to get the next line of data from the input file.

Now we get down to business. We must isolate the page number. Line 620 calculates the position in A$ where the first semi-colon is. Line 630 sets the variable P$ to the page number. Line 640 starts looking for the next semi-colon. It will start looking at the first character after the semi-colon at the end of the page. This will be the one at the end of the Item. Variable J will be the location of that semi-colon. If there is no semi-colon, then the line contains an Item only and no key words. In this case the variable J must be set to the length of A$ plus 1.

Line 660 creates B$ that is the Item and Reference. Line 670 removes leading blanks. Line 680 checks to see if the Item was blank. If it was blank then we do not want to print anything to the output file. But we must now check for key words. Line 680 assumes that there is a leading blank in front of every Item and Keyword in each line. If we do have an Item, then line 690

builds the Item, all key words, and reference. Line 700 removes leading blanks. Line 710 puts the data in the output file. Line 720 prints it on the CRT so the user can see what the data looks like. This also lets the user know that the program is running. The extra few microseconds it takes to print the data on the CRT are worth the additional information to the user. Line 730 counts the number of output lines. Line 740 checks to see if we are at the end of the line. If so, we go back for the next line. If not, we must try to find more key words. Lines 750 and 760 start searching for the end of the next keyword. If a zero is returned, line 770 will set the value of J to one greater than the length. This is as if the last key word was followed by a semi-colon instead of an end of line character. Line 780 calculates the key word and adds a semi-colon and space to it. Line 790 removes leading blanks. Line 800 prints the key word and item and reference on the output file. Line 810 prints the same to the CRT. Line 820 counts the number of lines going to the output file. Again we must check for the end of the current line in line 830 and if found go get the next input line. This process is repeated until the end of file is reached at which point the program ends. Now you can use the SORT program to sort this output file.

```
10 ' FROM KW/BAS
20 ' TO CREATE A KEY WORD FILE
30 ' BY PETER ANSBACHER, 918 SOUTH RUSTIC ROAD, COLUMBIA,
MO  65201
40 ' MAY 1, 1981
50 ' THIS PROGRAM IS NOT COPYRIGHTED.
60 ' YOU MAY USE IT IN ANY WAY YOU LIKE.
70 ' ACKNOWLEDGEMENT OF ORIGINAL AUTHOR WOULD BE APPRECIATED.
80 '
90 ' VARIABLES:
100 '
110 ' A$ = ONE LINE OF INPUT FILE
120 ' B$ = ITEM; REF
130 ' C$ = ITEM; KW; REF
140 ' F1$ = INPUT FILESPEC
150 ' F2$ = OUTPUT FILESPEC
160 ' K$ = KEY WORD
170 ' L = LENGTH OF A$
180 ' N = NUMBER OF LINES IN OUTPUT FILE
190 ' I,J = TEMPORARY VARIABLES
200 ' P$ = PAGE NUMBER
210 ' R$ = REFERENCE
220 ' S = 1 = SKIP OVER STATEMENT NUMBERS
230 '   = 0 = DO NOT SKIP OVER STATEMENT NUMBERS
240 '
250 CLEAR 1000
260 N=0
270 CLS
280 PRINT "KW/BAS"
290 PRINT
300 PRINT "TO CREATE A KEY WORD FILE FROM AN IR FILE"
310 PRINT
320 PRINT "ENTER INPUT FILESPEC ? " ;
330 LINE INPUT F1$
340 OPEN "I", 1, F1$
350 PRINT
360 PRINT "DOES THE INPUT FILE CONTAIN STATEMENT NUMBERS AND"
370 PRINT "SINGLE QUOTES THAT MUST BE SKIPPED OVER (Y/N) ? ";
380 LINE INPUT A$
390 S = 0
400 IF  LEFT$( A$, 1 ) = "Y"  THEN  S = 1
410 PRINT
420 PRINT "ENTER OUTPUT FILESPEC ? " ;
430 LINE INPUT F2$
440 OPEN "O", 2, F2$
450 '
460 IF  EOF(1)  THEN  850
470 LINE INPUT #1, A$
480 IF  A$ = ""  THEN  460 ' SKIP NULL LINES
490 '
500 ' SKIP OVER STATEMENT NUMBERS
510 IF  S = 1  THEN  A$ = MID$( A$, INSTR( 1, A$, "'" ) + 1 )
520 '
530 IF LEFT$( A$, 1 ) = " " THEN A$ = MID$( A$, 2 ) :
GOTO 530
540 IF LEFT$( A$, 2 ) = ".."  THEN  460 ' SKIP COMMENTS
550 L = LEN( A$ )
560 IF  LEFT$( A$, 1 ) <> "."  THEN  620
570 R$ = RIGHT$( A$, L-1 ) ' GET REFERENCE
580 IF LEFT$( R$, 1 ) = " "  THEN  R$ = MID$( R$, 2 ) :
GOTO 580
590 PRINT #2, " REFERENCE "; R$
600 PRINT " REFERENCE "; R$
605 N = N + 1 ' COUNT NUMBER OF LINES IN OUTPUT FILE
610 GOTO 460
620 I = INSTR( 1, A$, ";" ) ' FIND END OF PAGE
630 P$ = LEFT$( A$, I-1 ) ' PAGE NUMBER
640 J = INSTR( I+1, A$, ";" ) ' FIND NEXT ;"
650 IF  J = 0  THEN  J = L + 1
660 B$ = MID$( A$, I+2, J-I-2 ) + "; " + R$ + P$ ' ITEM
AND REF
670 IF LEFT$( B$, 1 ) = " " THEN  B$ = MID$( B$, 2 ) :
GOTO 670
680 IF  J = I + 2  THEN  740  ' SKIP IF NO ITEM
690 C$ = MID$( A$, I + 2 ) + "; " + R$ + P$  ' ITEM; KW; REF
700 IF LEFT$( C$, 1 ) = " " THEN C$ = MID$( C$, 2 ) :
GOTO 700
710 PRINT #2, C$
720 PRINT C$
730 N = N + 1 ' COUNT NUMBER OF LINES IN OUTPUT FILE
740 IF  J = L + 1  THEN  460  ' NO MORE KEY WORDS
750 I = J ' FIND KEY WORDS
760 J = INSTR( I+1, A$, ";" )
770 IF  J = 0  THEN  J = L + 1
780 K$ = MID$( A$, I + 2, J - I - 2 ) + "; "
790 IF LEFT$( K$, 1 ) = " " THEN K$ = MID$( K$, 2 ) :
GOTO 790
800 PRINT #2, K$ + B$
810 PRINT K$ + B$
820 N = N + 1 ' COUNT NUMBER OF LINES IN OUTPUT FILE
830 IF  J = L + 1  THEN  460 ' NO MORE KEY WORDS
840 GOTO 750 ' FIND NEXT KEY WORD
850 CLOSE
860 PRINT
870 PRINT N ; " LINES IN OUTPUT FILE " ; F2$
880 END
```

Description of SORT Program

The SORT program reads data from a file on disk into

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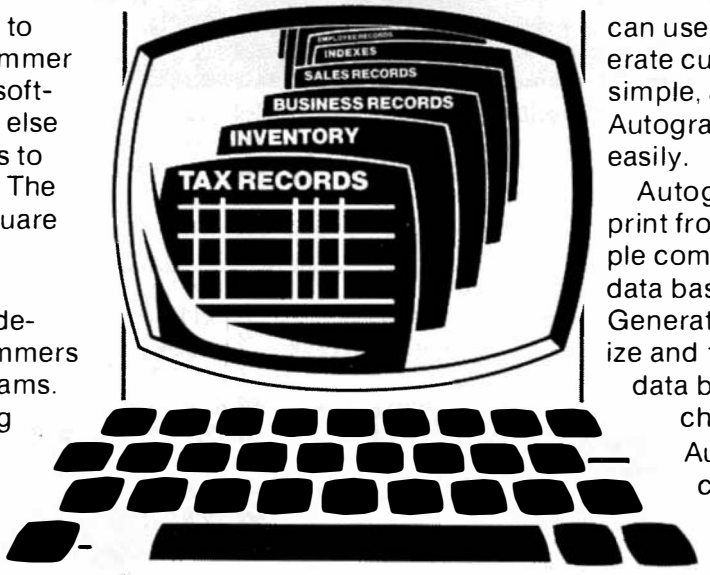

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The end of the square peg in the round hole.

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Roklan
Software

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memory, sorts it alphabetically, and writes it back out to disk to another file. The maximum number of lines read in is 2000. The total number of characters read in must not exceed 29,000. These limitations can be changed by changing the CLEAR and DIM statements in the program.

Line 210 reserves 29,000 bytes for strings. This value may be adjusted up or down. Line 220 defines all variables starting with A and I through N as being integer variables. This is imperative for proper execution of the assembly language sort routine. Line 230 defines the maximum number of lines that can be read from disk. This value may be changed up or down. Line 240 clears the CRT. Lines 250-370 print the name of the program, its purpose, and a reminder that high memory must be set to 65279 for a 48K system. If high memory is not properly set, the program stops. Line 380 calls the subroutine that will load the assembly language sort routine. Lines 390-460 prompt for the file names and open the files. Lines 470-530 read the data from disk. Lines 540-550 calculate and print the number of lines read in. Line 570 calls the sort subroutine. Lines 590-630 write the sorted data to disk. Lines 640-660 print the total number of lines written to disk and print the output file name. Lines 670-770 load the assembly language sort routine into core. Lines 790-840 call the assembly language sort routine.

You may not make any changes in lines 800-840. These statements must remain unchanged. This sort routine will sort 400 lines of data in less than 3 seconds.

```
10 ' FROM SORT/BAS
20 ' TO SORT A FILE
30 ' MAX 2000 LINES
40 ' BY PETER ANSBACHER, 918 SOUTH RUSTIC ROAD, COLUMBIA,
MO  65201
50 ' MAY 1, 1981
60 ' THIS PROGRAM IS NOT COPYRIGHTED.
70 ' YOU MAY USE IT IN ANY WAY YOU LIKE.
80 ' ACKNOWLEDGEMENT OF ORIGINAL AUTHOR WOULD BE APPRECIATED.
81 ' NOTE: THE ASSEMBLY LANGUAGE ROUTINE ORIGINALLY CAME FROM
82 '       RADIO SHACK TRS-80 MICROCOMPUTER NEWS, JULY 1980.
90 '
100 ' NOTE: HIGH MEMORY MUST BE SET TO  65279
110 '
120 '
130 ' VARIABLES:
140 '
150 ' A$() = ARRAY OF LINES TO SORT
160 ' F1$ = INPUT FILESPEC
170 ' F2$ = OUTPUT FILESPEC
180 ' N = NUMBER OF LINES READ
190 ' I5, I6, I7, I8, I9 = TEMPORARY VARIABLES FOR SORT
ROUTINE
200 '
210 CLEAR 29000
220 DEFINT A,I-N
230 DIM A$(2000)
240 CLS
250 PRINT "SORT/BAS"
260 PRINT
270 PRINT 'TO SORT A FILE"
280 PRINT
290 PRINT "* * * W A R N I N G * * *"
300 PRINT
310 PRINT "HIGH MEMORY MUST BE SET TO  65279"
320 PR NT
330 PRINT "HAS THIS BEEN DONE (Y/N) ?" ;
340 LINE INPUT A$
350 IF  LEFT$( A$, 1 ) <> "Y"  THEN  STOP
360 PRINT
370 PRINT "LOADING SORT ROUTINE, PLEASE WAIT . . ."
380 GOSUB 680 ' LOAD SORT ROUTINE
390 PRINT
400 PRINT "ENTER INPUT FILESPEC ? " ;
410 LINE INPUT F1$
420 OPEN "I", 1, F1$
430 PRINT
440 PRINT "ENTER OUTPUT FILESPEC ? " ;
450 LINE INPUT F2$
460 OPEN "O", 2, F2$
470 I = 0
480 LINE INPUT #1,A$(I)
490 IF  EOF(1)  THEN  520
500 I = I + 1
510 GOTO 480
520 '
530 CLOSE 1
540 N = I + 1
550 PRINT N ; " LINES READ IN"
560 PRINT "START OF SORT"
570 GOSUB 800 ' SORT DATA
580 PRINT "END OF SORT"
590 FOR I = 0 TO N-1
600 PRINT #2, A$(I)
610 PRINT A$(I)
620 NEXT I
630 CLOSE
640 PRINT
650 PRINT N ; " LINES IN OUTPUT FILE " ; F2$
660 END
670 ' TO LOAD SORT ROUTINE
680 DEFUSR = &HFF00
690 DIM I9(2)
700 I6 = 0
710 FOR I7 = 1 TO 203
720 READ I8
730 I6 = I6 + I8
740 POKE I7 - 257, I8
750 NEXT I7
760 IF  I6 <> 25337  THEN  STOP
770 RETURN
780 '
790 ' SORT DATA
800 I5 = 0
810 I9(0) = N
820 I9(1) = VARPTR( A$( 0 ) )
830 I5 = USR( VARPTR( I9( 0 ) ) )
840 RETURN
850 '
860 DATA 205,127,10,94,35,86,237,83,19,255,35,94,35,86,237,83
870 DATA 213,255,33,0,0,34,211,255,237,91,211,255,203,59,175
880 DATA 203,58,48,2,203,251,237,83,211,255,122,179,200,42,19
890 DATA 255,237,82,34,207,255,33,0,0,34,205,255,42,205,255,
34
```

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```
900 DATA 203,255,42,203,255,237,91,211,255,25,34,209,255,235,
33
910 DATA 0,0,25,25,25,229,237,91,203,255,33,0,0,25,25,25,237
920 DATA 75,213,255,9,235,225,9,229,213,14,0,126,71,26,184,48
930 DATA 3,14,1,71,175,176,40,25,197,19,35,78,35,70,197,225
940 DATA 235,78,35,70,197,225,193,26,150,56,10,32,39,19,35,16
950 DATA 246,203,65,32,31,209,225,6,3,78,235,126,113,235,119
960 DATA 35,19,16,246,42,211,255,235,42,203,255,175,237,82,34
970 DATA 203,255,48,144,24,2,209,225,42,205,255,17,1,0,175,25
980 DATA 34,205,255,237,91,207,255,237,82,218,58,255,195,24,
255
```

Description of the MERGE Program

The MERGE program will merge from 2 to 14 sorted files into one file. Before using this program, you must properly set the maximum number of files to use when you load BASIC. The default number is three. This program is primarily a stand alone program.

Lines 10-230 are comments about the program that are self explanatory. Line 240 clears 4000 bytes of storage for strings. This will allow for a maximum of 15 files each with a string of 255 characters. Line 250 defines all variables as integers. This is done to speed up execution time. Line 260 sets up an array to hold the current line in each file. Line 280 clears the CRT. Lines 290-450 print the program name, purpose, and get the names of all the files. Lines 480-500 get the first lines from each file. Lines 530-650 find the smallest line from each file and write it out to disk. This process is repeated until the end of all the input files are reached. Lines 690-730 get the next line from the desired file. If the end of file is sensed, then the value returned is CHR$(255).

```
10 ' FROM MERGE/BAS
20 ' TO MERGE ALPHABETICALLY 2 TO 14 FILES INTO 1 FILE
30 ' BY PETER ANSBACHER, 918 SOUTH RUSTIC ROAD, COLUMBIA,
MO  65201
40 ' THIS PROGRAM IS NOT COPYRIGHTED.
50 ' YOU MAY USE IT IN ANY WAY YOU LIKE.
60 ' ACKNOWLEDGEMENT OF ORIGINAL AUTHOR WOULD BE APPRECIATED.
70 '
80 ' VARIABLES -
90 ' ---------
100 '
110 ' A$(1-14) = LINE FROM EACH INPUT FILE
120 ' F$ = FILESPEC
130 ' N = NUMBER OF INPUT FILES
140 '
150 ' ASSUMPTIONS:
160 ' ------------
170 '
180 ' 1.  ALL FILESPECS ARE VALID
190 ' 2.  NO LINE IN ANY FILE CONTAINS JUST A CHR$(255).
200 ' 3.  AT LEAST 2 INPUT FILES ARE SPECIFIED.
210 ' 4.  THE PROPER NUMBER OF FILES HAVE BEEN SPECIFIED
220 '     WHEN BASIC WAS LOADED.
230 '
240 CLEAR 4000
250 DEFINT A-Z
260 DIM A$(14)
270 '
280 CLS
290 PRINT "MERGE/BAS"
300 PRINT
310 PRINT "TO MERGE ALPHABETICALLY 2 TO 14 FILES INTO 1 FILE"
320 PRINT
330 PRINT "ENTER OUTPUT FILESPEC ? " ;
340 LINE INPUT F$
350 OPEN "O", 1, F$
360 FOR I = 1 TO 14
370 F$ = ""
380 PRINT
390 PRINT "ENTER INPUT FILESPEC OR <ENTER> FOR NO MORE ? " ;
400 LINE INPUT F$
410 IF  F$ = ""  THEN  450
420 OPEN "I", I + 1, F$
430 NEXT I
440 I = 15
450 N = I - 1
460 '
470 ' GET FIRST LINE FROM EACH FILE
480 FOR I = 1 TO N
490 GOSUB 690
500 NEXT I
510 '
520 ' FIND SMALLEST
530 J = 1
540 FOR I = 2 TO N
550 IF  A$(I) >= A$(J)  THEN  570
560 J = I
570 NEXT I
580 I = J
590 IF  A$(I) = CHR$(255)  THEN  640
600 PRINT #1, A$(I)
610 PRINT A$(I)
620 GOSUB 690
630 GOTO 530
640 CLOSE
650 END
660 '
670 ' SUB TO GET NEXT LINE FROM FILE # I
680 ' RETURNS A$(I) = NEXT LINE OR CHR$(255) IF EDF
690 IF  EDF( I + 1 )  THEN  720
700 LINE INPUT # I + 1, A$(I)
710 RETURN
720 A$(I) = CHR$(255)
730 RETURN
```

Description of the LIST Program

The LIST program is a stand-alone program that lists ASCII files on the line printer. ASCII files can be created with the BASIC command SAVE"FILENAME",A which will save the program in ASCII format instead of compressed format. It alows you to specify the number of characters per line, to print each BASIC statement on one line for more readability, and to print line numbers for each line in case the file does not contain any line numbers.

Since this program was originally written and copyrighted by Radio Shack, I will refer you to the copy of the original

continued on page 42

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- how much an account purchased during month, how many invoices were sent, average invoice for month
- tell you what percent of sales an account is to total sales by month
- tell you what percent of a/r an account is
- print mailing labels for your accounts
- print statements at any time you want them (either individual or all accounts)
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- alphabetical sort of items sold by month
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AGING REPORT FOR LYNN'S A/R SYSTEM

Aging Report 01/31/82 Page 1

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Old Co. Inc.	00.00	84.40	165.20	00.00	249.60
New Co. Inc.	97.75	00.00	00.00	00.00	97.75
Deadbeat Inc.	00.00	00.00	00.00	345.00	345.00
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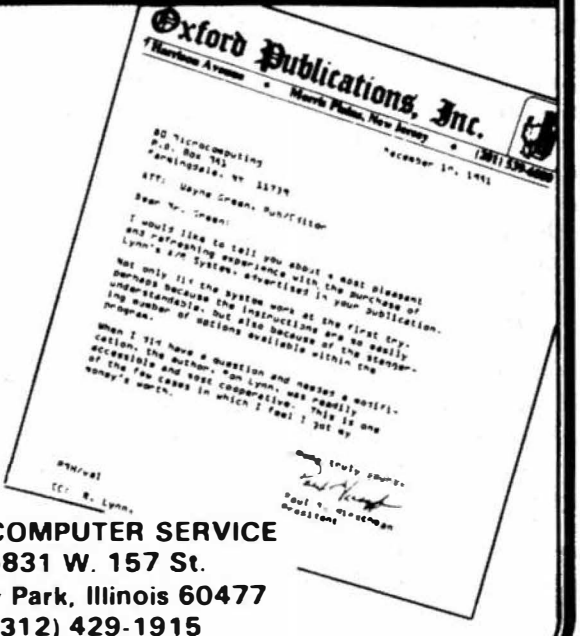
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COLOR COMPUTER CORNER

Joseph Rosenman

This month, I am going to begin a series of program reviews.

DIAGNOSTICS ROM

From: Radio Shack
System requirements: Any system.
Supplied on: ROM Pack.
Disk compatible: probably not.
Price: $29.95

The DIAGNOSTICS ROM for the Color Computer tests all of the non-disk functions on the Color Computer. These tests include:

1) A test of the BASIC ROM (CRC check).
2) A test of the Extended BASIC ROM (also a CRC check).
3) A quick RAM test.
4) A long RAM test.
5) A video test.
6) An RS232 test.
7) A sound generation test.
8) A cassette test.
9) A keyboard test.
10) A joystick test.
11) A printer test.

The desired test is selected from a general menu.

The ROM tests perform a CRC (Cyclic Redundancy Check) of the ROM chip, and the result is displayed. Unfortunately, simply knowing the result isn't enough to determine whether or not your ROMs are still correct. You need to contact a RADIO SHACK store to get the correct values. Then, you can compare your values with the ones given by the store. Why would they do it that way? One explanation could be simple malice. The probable reason is that the software on the ROM chips will undergo occasional modification, changing the CRC result. Rather than publishing results that might become incorrect, they side-stepped the entire problem. Frankly, I think it would have been much better to list the currently known values (along with identifying serial numbers if any), and explain that the newer CRC values have to be gotten from a Radio Shack store.

The RAM tests—well, they test RAM. These tests will accomodate the 4K, 16K, or 32K systems. The quick test takes 40 seconds in a 4K system, somewhat over 3 minutes in a 16K system. The long test requires 15 minutes for a 4K system, and about 4 hours for a 16K system!

I found the Video test to be kind of silly. It displays all of the characters, then proceeds to display 2 faces, then 1, then 4, ad nauseum. Well, the booklet did say the tests were supposed to be "entertaining." I suppose you could be sure that the video display is correct if it looks OK. Only the first part of this test is of any real value.

The RS232 test will verify that RS232 port is working (at up to 4000 Baud). There is one catch: you have to get a special cable that shorts out the transmit, receive, and status pins (everything except the ground). If this special connector is not present, the program will display "RS-232 PORT BAD", even though it might not be. If you ask me, since the ROM pack costs $29.95, they could have afforded to throw in a test cable. Unless you intend to purchase this cable, you had better pass this test up (I made my own cable!). The RS232 port is optionally used with either a printer and/or a modem.

The Sound Test," a sound test. Of course, all it does is "sound off" (enough with the puns already). This test requires "operator participation." The test produces a sine wave that runs the gamut of the computers available range (the 6 bit test), then a single bit high frequency pulse. If it sounds OK, it probably is OK.

The cassette test will write out a data block containing every possible byte (0 to 255). Then, the block is read back in and compared to the correct values. A "CASSETTE GOOD" or "CASSETTE ERROR" message will be displayed depending on the results. Of course, you must load a cassette into the recorder, and rewind the cassette after the write phase.

The keyboard test is another "operator participation" test. You type on the keyboard and the screen fills with whatever value was typed. Hitting break will return to the menu. The ENTER key, CLEAR key, and SPACE key all display their respective names when typed.

The Joystick test is another one of those "strange" tests. Each joystick will cause a specific color to display on the screen. By moving the joysticks around, you can "paint the screen". The resolution is set so that every value the joystick can produce is represented by a screen location.

The last test is the printer test. This test will send every printable value (from 20H to 7FH) to the printer. It requires a "standard" serial printer (300 Baud).

Evaluation: Should you get this program? Well, I personally feel that the asking price is a bit high (you figure out what the price would be if you reset the high order bit!). Of course, the program is on the more expensive ROM pack. It is important to have some kind of system diagnostic test, to periodically verify the condition of your computer. All things considered, the diagnostic program is reasonably useful. Unless you know of a better program (or intend to write one), this program serves a necessary function. The greater the frequency of computer use, the greater the need to insure that the computer is functioning normally. The bottom line is, the program will verify the Color Computer's operation.

GHOST GOBBLER

From: Spectral Associates, 141 Harvard Avenue, Tacoma, WA 98466, 206-565-8483
System requirements: 16K non-extended or extended

BASIC, and Joystick.
Supplied on: Cassette.
Disk compatible: Yes.
Price: $21.95

This game is very similar to PAC-MAN. Let me say at the outset that it is VERY well done. Since PAC-MAN is so well known, I needn't go into an explanation of how the game works. The visual display is excellent, the sound is appropriate. The net effect is one of a "slick" arcade game. This program has all the "extras" you would expect from a quality game. There is special bonus scoring, as well as 16 progressively difficult levels of play. Since this program is in machine language, everything happens fairly quickly. The instructions describe how to save the program to disk (if you have a disk). Spectral Associates included several copies on both sides of the cassette tape, so the chance of getting an unusable copy is remote.

Although this game was not exactly slow, I felt that the game could have been somewhat faster. With that in mind, I can pass on a little trick. As I have mentioned in an earlier issue, there is a special internal switch (accessed by the software) that will double the speed of the CPU. This speed increase is not guaranteed by Radio Shack, and not EVERY Color Computer can work at the faster speed. They only way to know is to try it out. The command that increases speed is: POKE 65495,1 (from BASIC). Ghost Gobbler is an "autostart" program. That means that once the program has been loaded (with a CLOADM), it begins to execute. I discovered that you can force a return to BASIC by hitting the reset button after the program has loaded. You may then enter the high speed POKE. If you then type EXEC, you will start executing Ghost Gobbler at twice the speed! Make sure that you increase speed immediately after a fresh CLOADM. If you try to POKE the speed up before the CLOADM, the cassette will not load correctly. If you try after you have been playing for awhile, memory will be sufficiently scrambled so as to prevent a "normal" return to BASIC (followed by an EXEC).

Evaluation: An excellent game. This is the kind of software Color Computer owners should expect and demand. If you enjoy arcade type games, this is the program for you. Spectral Associates has a real winner with this one. Let's hope they continue to produce more games of this caliber soon.

SCEPTER OF KZIRGLA

From: Rainbow Connection Software, 3514 8th Place NW, Rochester, MN 55901
System requirements: 16K Extended Basic.
Supplied on: Cassette tape.
Disk compatible: Yes (disk version).
Price: $16.95 ($21.95 for disk).

The Rainbow Connection has come up with an excellent adventure game. This game not only provides for the usual "explore the dungeons, fight the monsters, and get the treasure" scenario. It also makes intelligent use of the Color Computer and its special abilities. The game is played in "real time." While you are waiting, creatures might be plotting against you! (You can freeze the action by using the SHIFT-@ combination). The dungeon has thirteen floors, each of which is projected onto the screen. The graphics used are not high resolution, but they appear quickly. Each image forms a workable map through which you guide your character. Special unknown objects appear as purple blocks (the walls are all yellow, and monsters are red). The sound reinforces the action as the game progresses (you can hear the echo growing more distant as you fall through the trap door!). You move around by using the arrow keys. You can choose to play the game as either a Magician or as a Warrior. The instruction manual includes ample details (inluding details of the 10 different types of monsters that might attack you, and the 7 available weapons). In addition to the motion commands, there are 5 special commands. With these commands, you can fly over walls with your magic carpet, or bribe a monster.

Evaluation: A very classy adventure. Once again, I feel that one of its strongest points is that it clearly "belongs" on the Color Computer. If adventure games are "your thing," try this one out. There are many areas in which adventure games could be "enhanced". Some of you might be familiar with the adventure game "ZORK". The sophisticated command line parser and syntax analysis section (the routine that allows you to type in normal English sentences), adds a great deal to adventure games. The problem is, you need A GREAT DEAL of memory. SCEPTER OF KZIRGLA barely fits into the 16K Color Computer. My only reservation is with the speed of play. Enough happens during the course of the game, that small delays are inevitable. The solution? Try the high speed POKE patch (described above) after the program is loaded. It works like a charm. Of course, the monsters can now scheme at double speed as well.

This issue marks the beginning of a series of Color Computer software reviews, which will include both Radio Shack and independant software. A computer is only as useful as the software that can be run on it, and the Color Computer should be judged along with quality software. I have written to a number of software companies requesting copies of their programs for review. Many have responded with some of their offerings. Both Spectral Associates and The Rainbow Connection were kind enough to provide samples of their programs. Needless to say, Radio Shack doesn't provide evaluation copies of their software. For the upcoming issues, I intend to review one Radio Shack program, and several "independents". In this way, I hope that all of us "Color Computer Users" will benefit by learning about what software is available. If YOU have a product for the Color Computer, or wish to know about a product, please write to Computronics and let me know about it.

Joseph Rosenman
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PRACTICAL BUSINESS PROGRAMS

THE TRANSPORTATION METHOD OF LINEAR PROGRAMMMING

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

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The transportation method of linear programming is designed to handle a specialized set of problems associated with a from/to chart. Due to the fact many different business problems may be set up as from/to charts the transportation problem is a very useful tool to have available.

The program we developed may be used to maximize values or profits if they are known, or conversely it may be used to minimize cost. Examples of applications to which this program may be put include:

1. Minimizing the cost of shipping from a series of warehouses to a selection of customers.
2. Maximizing the profit of scheduling selected orders in available time periods.
3. Maximizing the profit associated with assigning selected individuals to known tasks.

The transportation model belongs to "assignment" type problems. The solution procedure presented here is one of a number of such procedures. In the April 1981 issue of H&E Computronics, Zimmerman and Bonner published a program for solving the zero-one assignment problem using the Flood method. This program uses some of the same type solution procedures developed for the earlier article, except this new approach is much broader in application.

Setting up the transportation model is one task you, the user, must become efficient with. We will review several detailed examples of how to set up a transportation problem. We assume you have never set up a problem of this nature before, so we will be very detailed. After we have set up several transportation models we will walk through how our program may be used for one of the examples.

TRANSPORTATION MODEL EXAMPLES

Two examples will be reviewed. They are the following:

1. Minimizing the cost of shipping from plants to warehouses
2. A production scheduling problem

Before starting our examples we must identify some terms. The place we are coming from is called a source. A source is found along the left hand side of the table. Another way of refering to a source is by its row number. The place we are going is called a sink. Sinks are also referred to as columns.

A source is said to have a fixed maximum capacity while a sink is said to have a fixed minimum requirement for service. In the program, the sum of the capacities must be to the sum of the requirements. If you have excess capacity, extra dummy sinks may be added. If you have inadequate capacity, no mathematical model or program can help you.

The cost or profit associated with each source-sink combination must be identified. In the classic shipping example the distance may be used as a measure of cost of shipping from one location to another, while commercial shipping rates may be obtained and used as another measure of costs.

In a profit situation, the actual profit may have to be calculated. We realize the task of setting up a transportation problem is not easy. Setting up your problem gives the manager important information of how the business is operating, and in some circumstances, may be as important as the numbers calculated by the computer.

The numbers calculated by the computer are called the assignment. They tell the user how much capacity of a given source should be shipped to a given sink.

SHIPPING EXAMPLE

Assume your company owns four plants and five warehouses. (Our transportation program can handle any number of sources with a limitation of 13 sinks). We have set up a sample table of costs for this example:

		Sinks = warehouses					
		I	J	K	L	M	
Source	A	10	12	33	12	34	Capacity = 102
=	B	22	11	13	34	17	Capacity = 98
plants	C	35	40	81	15	9	Capacity = 126
	D	12	72	6	66	41	Capacity = 100
Requirements		75	125	100	50	76	

Sum of capacity = sum of requirements = 426

The four plants are identified as A, B, C, and D. Each of the four plants have a fixed capacity. The five warehouses are identified as I, J, K, L, and M. Each of these warehouses have a specified requirement.

In a real problem the requirements are usually very easy to determine, but the capacity is very difficult. You must come up with some measure of capacity in the same units as the requirements are measured. Even if the measure is a rough one, it is needed.

In cases where the capacity limit is an approximation, be careful in the interpretation of the results. In one application we were able to obtain a very efficient result by adjusting capacities, then rerunning the analysis, after we used a preliminary run of the program to show us where the capacities were needed.

One more point about the capacities and requirements. The sum of the two sets of numbers total 426. The program will not work unless the sum of the capacities are equal to the sum of the requirements.

In the first row, first column position is the value of 10. This means the cost of shipping from Plant A to Warehouse I is 10 cents per item or, $10 per item, or $10,000 per item, etc. To speed up the solution procedure we have used integer arithmetic whenever possible. You may have to code your data to get it to fit our program.

The limitation on our program is almost any number of sources and 13 sinks. However, the act of going from A to B is the same as going from B to A, mathematically in many cases you can turn the problem around if the need arises. We recently ran a 9 by 202 problem as a 202 by 9 with very satisfactory results. It took over 6 hours to run, and it was necessary to have a special version of the program compiled (Made into a machine language program) to complete the task, but the decisions had to be made, and the program was very useful in reducing the costs associated with this effort.

The solution which minimizes the cost of shipping 426 items from A,B ... D to I, J, ... M is:

```
                Sinks = warehouses
            I    J    K    L    M
Source A   75   27   Ø    Ø    Ø    Capacity = 1Ø2
=      B   Ø    98   Ø    Ø    Ø    Capacity = 98
plants C   Ø    Ø    Ø    5Ø   76   Capacity = 126
       D   Ø    Ø   1ØØ   Ø    Ø    Capacity = 1ØØ
Requirements.....................
            75  125  1ØØ  5Ø   76

     Sum of capacity = sum of requirements = 426
```

The above results say that, by shipping 75 items from A to I, 27 items from A to J, 98 items from B to J, 50 items from C to L, 76 items from C to M, and 100 items from D to K, the cost will be minimized. You may calculate the cost for this assignment as follows:

From	To	Assignment	*	Cost	=	Subtotal
A	I	75	*	1Ø	=	75Ø
A	J	27	*	12	=	324
B	J	98	*	11	=	1Ø78
C	L	5Ø	*	15	=	75Ø
C	M	76	*	9	=	684
D	L	1ØØ	*	6	=	6ØØ
Total						4186

No matter how you adjust the assignment, no matter what transfers are made, you will find no assignment which results in a cost less than 4186 units. You may find alternate assignments which give you this same results but none better.

The assignment is what is produced by the program we have prepared. Since we told the computer to minimize, it selected to assign the shipping to the row-column combinations which had the lowest costs.

PRODUCTION SCHEDULING

When using the transportation model for production scheduling, care must be taken in identifying the source of capacity, and the location of need. In general, capacity comes from a place during a specified time period, and the need is similarly identified. Assume you have one plant and want to plan your product for April through August. Your capacities in hours are:

Plant A	Capacities
April	150
May	125
June	100
July	75
August	150

You have also identified your needs for a given product in terms of pieces. You know in this plant the production rate is 25 per hour. Your requirements in terms of pieces and hours are:

Period	Requirements Pieces	Hours
April	38ØØ	152
May	2ØØØ	8Ø
June	2ØØØ	8Ø
July	2ØØØ	8Ø
August	2ØØØ	8Ø

If you add up the capacities you will find 600 hours are available. Summing the requirements shows 472 hours are needed. We went through the exercise of converting pieces to hours to demonstrate the need to have both capacity and requirements in the same units. The excess of 600 over 472, or 128 hours must be assigned to a dummy demand which we will call DUMmonth.

The cost in the table must be associated with the units of capacity. For example, the cost to produce in a given month for the purpose of selling that same month, is $12.00 per hour. We can construct the following incomplete table.

```
Source: Sink··· Month
Month   April  May  June  July  August  DUMmonth
April    12                                    Cap =15Ø
May           12                               Cap =125
June               12                          Cap =1ØØ
July                    12                     Cap = 75
August                       12                Cap =15Ø
Requirements.....................................
        152   8Ø   8Ø   8Ø    8Ø      128
```

To determine the cost for DUMmonth, we will assume the cost of not producing is zero. This may not be true in all cases, but it is a method of using the transportation model.

We have assumed the cost of storing one item of production for a single month is $0.25, and there is no shelf life limit in our sample application.

If we produce 25 items per hour and if it costs .25 per month to store an item then 25 * .25 or $6.25 per month will be needed to store one hours worth of production. In two months the cost is assumed to be $12.50. Note: If we put numbers with values to the right of the decimal point into our program's table the values will not be printed. They are there and will affect the outcome of the analysis.

The table now looks like the following:

Source:	Sink---	Month					
Month	April	May	June	July	August	DUMmonth	
April	12	18.25	24.5	30.75	37	Ø	Cap =15Ø
May		12	18.25	24.5	30 75	Ø	Cap =125
June			12	18.25	24.5	Ø	Cap =1ØØ
July				12	18.25	Ø	Cap = 75
August					12	Ø	Cap =15Ø
Requirements.....							
	152	8Ø	8Ø	8Ø	8Ø	128	

Calculating an accurate cost for an order which is late is very difficult. There is no accounting procedure designed for this purpose. One way to avoid the issue and allow the use of our program is to use a number such as 99 for all late orders. This number is high, relative to the other numbers in the table, and will effectively force the scheduling of orders such as to eliminate late orders under most conditions. We decided to do this, and fed the following table into the computer.

Source:	Sink---	Month					
Month	April	May	June	July	August	DUMmonth	
April	12	18.25	24.5	30 75	37	Ø	Cap =15Ø
May	99	12	18.25	24.5	30.75	Ø	Cap =125
June	99	99	12	18.25	24.5	Ø	Cap =1ØØ
July	99	99	99	12	18.25	Ø	Cap = 75
August	99	99	99	99	12	Ø	Cap =15Ø
Requirements.....							
	152	8Ø	8Ø	8Ø	8Ø	128	

The above table was analyzed by the program with the following assignment table being produced:

Source:	Sink---	Month					
Month	April	May	June	July	August	DUMmonth	
April	15Ø	Ø	Ø	Ø	Ø	Ø	Cap =15Ø
May	Ø	8Ø	Ø	Ø	Ø	45	Cap =125
June	Ø	Ø	8Ø	5	Ø	15	Cap =1ØØ
July	Ø	Ø	Ø	8Ø	Ø	Ø	Cap = 75
August	2	Ø	Ø	Ø	8Ø	68	Cap =15Ø
Requirements.....							
	152	8Ø	8Ø	8Ø	8Ø	128	

A careful review of the assignment table indicates a problem. Two items are scheduled for delivery in August to satisfy the April demand! The capacity of April is 150 hours and the April need is 152 hours. This means trouble beyond the ability of a computer program to solve. You the manager must take some action to solve this problem.

The extra capacity is allocated to May, June, and August. The only time it is necessary to produce and store is in June for the July demand.

Calculations of the costs are shown in the table at the top of the next column.

The program will do all the work for you including the above calculations. It will not do your thinking for you. You must analyze your situation and set up data which is meaningful and useful. You must carefully look over the results and determine if they are helpful to your business.

RUNNING THE PROGRAM

The program starts with credits and a request for a title

	From	To	Assignment	*	Cost	=	Subtotal
	April	April	15Ø	*	12	=	18ØØ.ØØ
	May	May	8Ø	*	12	=	96Ø.ØØ
	May	DUMmonth	45	*	Ø	=	Ø.
	June	June	8Ø	*	12	=	96Ø.ØØ
	June	July	5	*	18.25	=	91.25
	June	DUMmonth	15	*	Ø	=	Ø.
	July	July	75	*	12	=	9ØØ.ØØ
****	August	April	2	*	99	=	198.ØØ
	August	August	8Ø	*	12	=	96Ø.ØØ
	August	DUMmonth	68	*	Ø	=	Ø.
	Total						5869.25

and date. Identification of the problem and the date of analysis can be very important at some future time when an old run is being examined and used.

The display will look like the following:

A TRANSPORTATION PROBLEM

STEVEN M. ZIMMERMAN, PH.D. & LEO M. CONRAD 1982
TITLE AND DATE (XX/XX/XX)?

After you have completed the title and date the program continues:

SELECT OUTPUT H HARD COPY AND CRT, C CRT ONLY, R HARD COPY ONLY?

H and C will result in a series of paging instructions such as ENTER TO CONTINUE while R will result in continued production of output on the printer. When R is used the operator may have trouble reading the results as it is rapidly produced on the screen.

SELECT INPUT 0=READ 1=KEYS?

Built into the program coding is a sample problem you may change. Inputting data through the use of DATA statement may be a good selection for some situations. We will detail how to use this option when we review the program coding.

To use the DATA statement input 0 to the above question. To input data from the keyboad input a 1. We assume you inputted a one for this discussion.

The next question is:

NUMBER OF ROWS?

Each row contains a source of capacity. In the shipping example five rows were used; in the production example there were six rows. Assume we are inputting the shipping example. The proper answer to the question would be five.

The next question is:

NUMBER OF COLUMNS -LIMIT 13-?

In the shipping case six columns were needed. You may

wonder where the limit of 13 comes from. It is due to the size of the computer's screen. If more than 13 columns are used the output will not fit on the screen.

Input 6 and hit ENTER to continue to the next question:

```
1 FOR MINIMUM OR 2 FOR MAXIMUM?
```

The program will solve both minimization problems. Both our examples required an answer of one since they were both minimization problem. Input 1 and hit the ENTER key.

The next question is:

```
0 FOR WORK OR 1 FOR RESULTS ONLY?
```

Some of you may wish to watch the computer work through its solution procedure as it approaches the final solution. We needed to do this when we wrote the program in order to find and eliminate our errors. Some problems will take many pages of output if you decide to look at the detail work. We suggest you input 1 and hit ENTER for results only.

Our next question is:

```
5       ROWS BY         6       COLUMNS
ROW     1
?
```

The method we have selected to input our data may seem strange at first. As you use the program you will find the method is very efficient for large tables. The input for the first row of the shipping example should look like the following:

```
?10,12,33,12,34          followed by hitting the ENTER key
??                       followed by hitting the ENTER key again
ROW     2
?
```

Each row must now be inputted in turn. When you have put in the costs data you will see:

```
INPUT CAPACITIES
?
```

The program is designed for you to put the capacities in, one row at a time. In this case the order is 102 followed by an ENTER, 98 followed by an ENTER etc. After you have completed this task the next question you will see is:

```
INPUT REQUIREMENTS
?
```

The method of inputting requirements is the same as for capacities. They must be typed in one at a time. When you are finished the computer prints the input matrix for you to check, and then the solution. Since we have already detailed the results we will not repeat the results here.

```
10 CLEAR 100:DEFINT I,J,L:A$=" ### ":REM THIS IS "TRANS" A
TRANSPORTATION PROBLEM
20 CLS:!PRINT CHR$(23): PRINT "A TRANSPORTATION PROBLEM
": PRINT: PRINT "STEVEN M. ZIMMERMAN, PH.D  & LEO M. CONRAD
1982"
30 WG=1: INPUT "TITLE AND DATE (XX/XX/XX)";T$,DD$:A1$="ROW
    COLUMN"
```


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```
4Ø CLS: INPUT "SELECT OUTPUT H HARD COPY AND CRT, C CRT ONLY,
R HARD COPY ONLY";P$:IF P$="R" OR P$="C" OR P$="H" THEN 6Ø
5Ø GOTO 4Ø
6Ø INPUT "SELECT INPUT Ø=READ  1=KEYS  ";IP:IF IP=Ø THEN 112Ø
7Ø IF IP <> 1 THEN 6Ø
8Ø INPUT "NUMBER OF ROWS";NR%:INPUT "NUMBER OF COLUMNS -LIMIT
13-";NC%:DIM A(NR%,13),B(NR%,13),IQ%(NR%,13),C%(NC%),R%(NR%),
IC%(NR%),IR%(NC%),RO%(NR%),CO%(NC%),IA%(NR%),JA%(NC%),
IP%(NR%),JP%(NC%)
9Ø IF NC% > 13 THEN PRINT "OVER COLUMN LIMIT":END
1ØØ INPUT "1 FOR MINIMUM OR 2 FOR MAXIMUM";K%: INPUT " Ø FOR
WORK OR 1 FOR RESULTS ONLY" ;NC
11Ø PRINT NR%," ROWS BY",NC%," COLUMNS":FOR I=1 TO NR%: PRINT
"ROW ",I: INPUT A(I,1),A(I,2),A(I,3),A(I,4),A(I,5),A(I,6),
A(I,7),A(I,8),A(I,9 ),A(I,1Ø),A(I,11),A(I,12),A(I,13): NEXT I
12Ø SC%=Ø:SR%=Ø
13Ø PRINT "INPUT CAPACITIES": FOR I=1 TO NR%: INPUT IC%(I):
SC%=SC%+IC%(I): NEXT I: PRINT "INPUT REQUIREMENTS": FOR J=1
TO NC%: INPUT IR%(J): SR%=SR%+IR%(J): NEXT J: IF SR% <> SC%
THEN PRINT "CAPACITY<>REQUIRMENTS TRY AGAIN": GOTO 12Ø
14Ø PRINT "THIS IS THE INPUT MATRIX": PRINT A1$: FOR J=Ø TO
NC%: PRINT USING A$;J;: NEXT J: PRINT : FOR I=1 TO NR%: PRINT
USING A$;I;: FOR J=1 TO NC%: PRINT USING A$;A(I,J);: NEXT J:
PRINT USING A$;IC%(I): NEXT I
15Ø PRINT USING A$;Ø;: FOR J=1 TO NC%: PRINT USING A$;
IR%(J);: NEXT J: PRINT
16Ø IF P$="H" OR P$="R" THEN LPRINT"      THE TRANSPORTATION
PROBLEM": LPRINT" ": LPRINT "          STEVEN M. ZIMMERMAN,
PH.D. & LEO M. CONRAD 1982"
17Ø IF P$="H" OR P$="R" THEN LPRINT " INPUT MATRIX": LPRINT"
": LPRINT "TITLE :",T$: LPRINT"DATE :",DD$: LPRINT A1$: FOR
J=Ø TO NC%: LPRINT USING A$;J;: NEXT J: LPRINT" ": FOR I=1 TO
NR%: LPRINT USING A$;I;: FOR J=1 TO NC%: LPRINT USING
A$;A(I,J);: NEXT J: LPRINT USING A$;IC%(I): NEXT I
18Ø IF P$="H" OR P$="R" THEN LPRINT USING A$;Ø;: FOR J=1 TO
NC%:LPRINT USING A$;IR%(J);:NEXT J:LPRINT" "
19Ø IF P$="C" THEN INPUT"ENTER TO PAGE";DU$
2ØØ IF K%=1 THEN 24Ø
21Ø M=Ø
22Ø FOR I=1 TO NR%:FOR J=1 TO NC%:IF A(I,J) > M THEN M=A(I,J)
23Ø NEXT J: NEXT I: FOR I=1 TO NR%: FOR J=1 TO NC%:
A(I,J)=M-A(I,J): NEXT J: NEXT I: ZZ=M
24Ø FOR I=1 TO NR%: TM=A(I,1): FOR J=1 TO NC%:IQ%(I,J)=Ø:
IF A(I,J) < TM THEN TM=A(I,J)
25Ø NEXT J: FOR J=1 TO NC%:B(I,J)=A(I,J)-TM: NEXT J: NEXT I
26Ø FOR J=1 TO NC%:TM=B(1,J): FOR I=1 TO NR%: IF B(I,J) < TM
THEN TM=B(I,J)
27Ø NEXT I: FOR I=1 TO NR%:B(I,J)=B(I,J)-TM: NEXT I: NEXT J
28Ø FOR I=1 TO NC%:CO%(I)=Ø:C%(I)=Ø: NEXT I
29Ø FOR I=1 TO NR%: FOR J=1 TO NC%: IF B(I,J) <> Ø THEN 32Ø
3ØØ IA=IC%(I)-RO%(I):IB=IR%(J)-CO%(J):IM=IA: IF IM > IB THEN
IM=IB
31Ø IQ%(I,J)=IQ%(I,J)+IM:RO%(I)=RO%(I)+IM:CO%(J)=CO%(J)+IM
32Ø NEXT J
33Ø NEXT I
34Ø FOR J=1 TO NC%:TT=IR%(J)-CO%(J):IF TT > Ø THEN 36Ø
35Ø C%(J)=1
36Ø NEXTJ
37Ø J=Ø
38Ø J=J+1:IF C%(J)=1 THEN 42Ø
39Ø FOR I=1 TO NR%:IF R%(I)=1 THEN 41Ø
4ØØ IF B(I,J)=Ø THEN 43Ø
41Ø NEXT I
42Ø IF J<NC% THEN 38Ø ELSE 99Ø
43Ø B(I,J)=-2:R%(I)=Ø:TT=IC%(I)-RO%(I): IF TT>0 THEN 72Ø
44Ø R%(I)=1: FOR II=1 TO NR%: IF R%(II) <> 1 THEN 5ØØ
45Ø FOR JJ=1 TO NC%: IF C%(JJ) <> 1 THEN 49Ø
46Ø IF IQ%(II,JJ)=Ø THEN 49Ø
47Ø IF B(II,JJ) <> Ø THEN 49Ø
48Ø C%(JJ)=Ø:B(II,JJ)=-1
49Ø NEXT JJ
5ØØ NEXT II
51Ø FOR JJ=1 TO NC%: IF C%(JJ)=1 THEN 55Ø
52Ø FOR II=1 TO NR%: IF R%(II)=1 THEN 54Ø
53Ø IF B(II,JJ)=Ø THEN 37Ø
54Ø NEXT II
55Ø NEXT JJ
56Ø TM=99999
57Ø FOR I=1 TO NR%:J=Ø: IF R%(I)=1 THEN 62Ø
58Ø J=J+1: IF C%(J)=1 THEN 61Ø
59Ø IF B(I,J)<Ø THEN 61Ø
6ØØ IF B(I,J) < TM THEN TM=B(I,J)
61Ø IF J<NC% THEN 58Ø
62Ø NEXT I
63Ø FOR I=1 TO NR%:J=Ø: IF R%(I) <> 1 THEN 66Ø
64Ø J=J+1: IF B(I,J) > -1 THEN B(I,J)=B(I,J)+TM
65Ø IF J<NC% THEN 64Ø
66Ø NEXT I
67Ø J=Ø
68Ø J=J+1:IF C%(J)=1 THEN 71Ø
69Ø FOR I=1 TO NR%: IF B(I,J) > -1 THEN B(I,J)=B(I,J)-TM
7ØØ NEXT I
71Ø IF J<NC% THEN 68Ø ELSE 37Ø
72Ø M2=99999: KA=Ø: KP=1: MY=1: MX=IC%(I)-RO%(I): IP%(1)=I:
JP%(1)=J: JT =1: IF M2>MX THEN M2=MX
73Ø IT=Ø: FOR II=1 TO NR%: IF B(II,J) <> -1 THEN 75Ø
74Ø KA=KA+1:IA%(KA)=II:JA%(KA)=J:KS=II:MY=2:IT=8: GOTO 76Ø
75Ø NEXT II: IF IT=Ø THEN 87Ø
76Ø IF M2>IQ%(KS,J) THEN M2=IQ%(KS,J)
77Ø FOR L=1 TO NC%: IF B(KS,L) <> -2 THEN 79Ø
78Ø KP=KP+1:IP%(KP)=KS:JP%(KP)=L:IT=9: GOTO 8ØØ
79Ø NEXT L: IF IT <> 9 THEN 87Ø
8ØØ J=L: IF JT=1 THEN 84Ø
81Ø IF MI=Ø THEN 73Ø
82Ø MI=IC%(KS)-RO%(KS): IF M2<MI THEN M2=MI
83Ø JT=1: GOTO 73Ø
84Ø MI=IR%(J)-CO%(J): IF MI=Ø THEN 73Ø
85Ø IF M2>MI THEN M2=MI
86Ø JT=2: GOTO 73Ø
87Ø IF MY<>1 THEN 9ØØ
88Ø MT=IR%(J)-CO%(J): IF M2>MT THEN M2=MT
89Ø IQ%(I,J)=IQ%(I,J)+M2:RO%(I)=RO%(I)+M2:CO%(J)=CO%(J)+M2:
GOTO 92Ø
9ØØ FOR I=1 TO KA: IQ%(IA%(I),JA%(I))=IQ%(IA%(I),JA%(I))-M2:
RO%(IA%(I))=RO%(I A%(I))-M2:CO%(JA%(I))=CO%(JA%(I))-M2:NEXT I
91Ø FOR I=1 TO KP: IQ%(IP%(I),JP%(I))=IQ%(IP%(I),JP%(I))+M2:
RO%(IP%(I))=RO%(I P%(I))+M2:CO%(JP%(I))=CO%(JP%(I))+M2:NEXT I
92Ø I=1
93Ø IF I>NR% THEN 97Ø
94Ø R%(I)=Ø: FOR J=1 TO NC%:C%(J)=Ø: IF B(I,J)<Ø THEN
B(I,J)=Ø
95Ø NEXT J
```

```
96Ø I=I+5: GOTO 93Ø
97Ø IF NC<> 1 THEN 1Ø1Ø ELSE 34Ø
98Ø FOR J=1 TO NC%:IT=IR%(J)-CO%(J): IF IT=Ø THEN C%(J)=1:
GOTO 34Ø
99Ø FOR J=1 TO NR%:IT=IC%(J)-RO%(J): IF IT <> Ø THEN 56Ø
1ØØØ NEXT J:WG=Ø
1Ø1Ø PRINT A1$: PRINT A2$: PRINT USING A$;Ø;: FOR I=1 TO NC%:
PRINT USING A$;I;: NEXT I: PRINT: FOR I=1 TO NR%: PRINT USING
A$ ;I;: FOR J=1 TO NC%: PRINT USING A$;IQ%(I,J);: NEXT J:
PRINT USING A$;IC%(I): NEXT I
1Ø2Ø PRINT USING A$;Ø;: FOR J=1 TO NC%: PRINT USING A$;
IR%(J);: NEXT J: PRINT
1Ø3Ø IF P$="H" OR P$="R" THEN LPRINT"ROW
            COLUMN": LPRINT USING A$;Ø;: FOR J=1 TO NC%:
LPRINT USING A$;J;: NEXT J: LPRINT " "
1Ø4Ø IF P$="H" OR P$="R" THEN FOR I=1 TO NR%: LPRINT USING
A$;I;: FOR J=1 TO NC%: LPRINT USING A$;IQ%(I,J);: NEXT J:
LPRINT USING A$;IC%(I): NEXT I: LPRINT USING A$;Ø;: FOR J=1
TO NC%: LPRINT USING A$;IR%(J);: NEXT J: LPRINT " "
1Ø5Ø IF WG=Ø THEN 1Ø8Ø
1Ø6Ø IF P$="R" THEN 34Ø
1Ø7Ø INPUT "HIT RETURN TO PAGE";G$: GOTO 34Ø
1Ø8Ø SU=Ø: FOR I=1 TO NR%: FOR J=1 TO NC%: IF K%=1 THEN
SU=SU+IQ%(I,J)*A(I,J) ELSE SU=SU+IQ%(I,J)*(ZZ-A(I,J))
1Ø9Ø NEXT J,I
11ØØ PRINT " VALUE IS ";SU: IF P$ <> "C" LPRINT "VALUE IS ";SU
111Ø END
112Ø READ NR%,NC%: DIM A(NR%,13), B(NR%,13), C%(NC%),
IQ%(NR%,13), R%(NR%), IC%(NR%),IR%(NC%), RO%(NR%), CO%(NC%),
IA%(NR%), JA%(NC%), IP%(NR%), JP%(NC%): READ K%,NC
113Ø DATA 6,5
114Ø DATA 1,1
115Ø FOR I=1 TO NR%: READ A(I,1),A(I,2),A(I,3),A(I,4),A(I,5),
A(I,6),A(I,7),A(I,8),A(I,9),A(I,1Ø),A(I,11),A(I,12),A(I,13):
NEXT I
116Ø DATA 8,3,2,7,5,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
117Ø DATA12,9,7,9,13,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
118Ø DATA6,2,3,8,2,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
119Ø DATA 1,5,9,8,7,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
12ØØ DATA 2,5,8,9,8,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
121Ø EATA 1,2,6,9,7,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
122Ø FOR I=1 TO NR%: READ IC%(I): NEXT I
123Ø DATA 1,5,2,6,8,1
124Ø FOR J=1 TO NC%: READ IR%(J): NEXT J
125Ø DATA 9,6,2,5,1
15ØØ GOTO 14Ø
```

EXAMINING THE PROGRAM

Lines 10 through 200 are designed to input the data and instructions. If you are solving a maximum problem, lines 210 through 230 are used to convert a profit table into an opportunity cost table. The assignment which minimizes the opportunity cost table is found. This assignment is the same assignment which maximizes the original profit table.

From line 240 through line 1000 the program is designed to find the assignment which minimizes the table inputted. Line 1010 begins the output of results.

Of particular interest to you, the user, are lines 1120 on. In these lines you will find the DATA statements which you may use to input your data.

continued on page 33

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BEGINNER'S CORNER

Lend an Ear to the Big Boys (Part 1 of 2)

Spencer Koenig

As the sign above says, "lend an ear." It seems the pros have a great deal to say and a great deal to offer to those computer ears of that ever famous team, Big and Little Business. Don't get me wrong, they have lots of appeal to the individual as well, as you will (I hope) clearly see.

Welcome back. As you recall the subject last time was bulletin boards. However those boards that I spoke about were run by small businesses or just plain folk. It seems the more I wrote about them the more possibilities came to mind. If you think about it, though, who would be the likeliest to take advantage of the latest in technologies of telecommunications?

The answer is obviously those who can afford to get the super software and super equipment. Quick, name two companies that are essentially super bulletin boards. If you said COMPUSERVE or THE SOURCE, you be absolutely correct. If you said some others, fine. However, these are the guys I'm gonna write about. OK?

To be fair I'll discuss them in alphabetical order. Compuserve is available to the public, as long as you have a terminal or smart terminal package. You can purchase time on the system from Radio Shack via Videotex. I recommend you read Joseph Rosenman's article to get some of the basic information about the package itself.

What I find interesting about the whole idea of these bulletin boards is that they can become extensions of your own machine. You can download programs, newspaper articles, purchase documentation to the system, locate various items for purchase that are not available in your area and the list goes on. In short the systems become a window to the world, quite literally.

Take a quick glance through example 1, and you will find the complete list of news and alternative information sources available at the time I logged on.

EXAMPLE 1. (some interesting and useful "information provider codes")

The main categories are: (Sounds like some academy or other)

NEWSPAPERS----HOM - Home Services
FIN - Business and Financial
PCS - Personal Computing.

And in an official CPU tone, the service tells you that "The following lists the Information Provider codes that can be found in each of these main areas": (I.P.C's will be explained shortly)

NEWSPAPERS

CDP – Columbus Dispatch
NYT – New York Times
VPL – Virginia Pilot-Ledger
TWP – The Washington post
SFC – San Francisco Chronicle
SFE – San Francisco Chronicle
LAT – Los Angeles Times
MST – Minneapolis Star Tribune
AJC – Atlanta Journal Constit.
SPD – St. Louis Post Dispatch
MDN – Middlesex Daily News

HOME SERVICES

WEA – Weather
ASI – Aviation Safety Institute.
BHG – Better Homes & Garden
NMM – Movie Reviews
PSE – Popular Science – Energy
PSP – Popular Science – New Prod
TFF – The Future File
TRB – The Refundle Bundle
GPO – Government Publications
VIF – Video Information
TCB – The College Board
TMC – The Multiple Choice

BUSINESS AND FINANCIAL SERVICES

CNS – Commodity News Service
INV – Investment News and Views
SBR – Small Busines Report
ACR – Archer Commodity Report
FED – The Federal Report

PERSONAL COMPUTING SERVICES

ATR - Atari Newsletter
RCA – RCA Newsletter
TRS – Tandy Newsletter
MCS – Microsoft Newsletter
TMA – The Micro Advisor

I think it's pretty incredible that all this can be made available instantly. No matter how much I've seen or read about this kind of INSTANT SOCIETY THROUGH INSTANT INFORMATION, (just add cpu and mix) I think it's terrific and frightening at the same time, especially when it happens to me on a first hand basis.

In EXAMPLE 2, I have the commands in the order as they appear on the Compuserve listing. They're straight forward and easy to understand. I suggest that you study them before logging on so that you can make best use of the system. Remember when you log on to this board you are paying for it.

EXAMPLE 2. — Brief Command Summary

T – TOP menu page
M – previous MENU
F – FORWARD a page
B – BACK a page
H – HELP
R – RESEND a page
S n – SCROLL from item "n"
G n – GO directly to page "n"
N – display NEXT menu item
P – display PREVIOUS menu item

Many of the commands can be abbreviated so that they're unique. The exceptions are commands that exit the menus such as MICRONET or EXIT which can only be abbreviated to a minimum of 3 characters.

As for control keys, be sure to terminate all commands with a <Carriage Return>. To interrupt a display output use a control-P(ause).

In example 3 you will find the commands and their descriptions, to help you in accessing the CompuServe Information Service with time conserving ease. There are so many options available on the "professional" board that it will probably take a while to become fluent in their use, but that's half the fun, isn't it?

EXAMPLE 3 (commands and their meaning)----------

T - TOP

TOP menu page. This command takes you right to first page of the compuserve data base. In other words, from where ever you are to the Compuserve information service (CIS-1) page one.

M - MENU

Previous MENU. The M command goes back to the menu page that points to the current page. This command will appear at the end of the paragraph in case you don't wish to continue. A single <ENTER> will also return to the last menu as long as the page you're on is the last page.

G - GO

Go n ..... GO directly to page "n." Do not pass go. Do not collect 200 dollars (sounds familiar, huh?). "N" may either be an "information provider/number" combination (this term is explained a little further down the page), like TRS-1, or a number alone.

H - HELP

HELP lists this help file (which is in standard Compuserve semi-antisetic computer tone).

S - SCROLL

S n ..... SCROLL from item "n." The "S" command will continously output pages until the last page in a series is reached. If you happen to be at a menu page, then the "n" will specify the menu item from which to scroll.

OFF or BYE

OFF (your rocker) or BYE (BYE Blackbird), (I hope you can figure out what these are suppossed to accomplish, but, just to be thorough) these commands will disconnect you from Compuserve

F - FORWARD

FORWARD (a page) will display the next page. A single <ENTER> key does the same thing.

B - BACKWARD

You guessed it. This is the opposite of forward and it also "takes you back" (I love that phrase) to the previous display.

P - PREVIOUS

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Means you want to go to the PREVIOUS item from last selected menu. For example, if 6 was your last choice, PREVIOUS will display item 5. Clever huh?

R - RESEND

RESEND the current page. This is useful if the current page has scrolled off the screen, which can happen quite a bit. It's also useful if you found that you needed a HELP command and you want to return from whence you came.

Information Provider Codes (Finally!!) ---- These are the three-digit codes shown in example 1. When used together with the G or GO command, you move directly to any item of interest on the service.

Some of the micro-computer extension capabilities (See, I can write jargon too!) offered by CIS is the ability to store and retrieve a great deal of information. Some of which Joseph spoke about in his article, but, because he was using his color computer, he wasn't able to utilize.

One example should be obvious. You can save information from the big system to your system for later use. This can be very important, especially if you access the DOW JONES type of information. It's also possible to save information on the system disks available to all users (Joe mentioned this). Personally I prefer the former situation of downloading onto my system.

OK, enough about the business end of this mind boggling present tense sci-fi real-time reality. I want to talk about what it was like and what I did on the system. The first time I tried to log on I wasn't too successful. I purchased the Radio Shack Videotex system and filled out the required forms. The forms weren't necessary to log on to the system but they are if you intend to continue using the system. In the package you get a password and I.D.

When I first attempted to log on the system didn't recognize either of my required codes. The system does have an alternative outlined in the package. Just be careful when reading the documentation, it can be confusing at first.

Once I was logged on, I perused the various menus for items of interest. My particular leanings are towards multiple player space games and adventures. I found two that looked interesting and successfully got into the games. One of the outcomes can be seen in examples 4a-e.

EXAMPLE 4A
DECWAR Version 2.3, 20-Nov-81

Are you:
1 Beginner
2 Intermediate
3 Expert

Which? 1

EXAMPLE 4B
Current output switch settings:

Medium output format.
Normal command prompt.
Long SCAN format.
Absolute coordinates are default for input.
Both coordinates are default for output.
Terminal type: PRegame

EXAMPLE 4C
There are Romulans in this game.
Black holes are NOT in this game.

1 Romulan in game

1 Federation ship in game
1 Empire ship in game

3 Federation bases in game
6 Empire bases in game

10 neutral planets in game
2 Federation planets in game
11 Empire planets in game

EXAMPLE 4D
Your name please: SSPPEENNCCEERR

Enter HELp, PREgame, or blank
line: HHEELLPP

(The double letters were due to a wrong setting on my terminal not because of fear or anything like that, got it?)

For a list of commands type HELP *
For help on a particular command type HELP command

EXAMPLE 4E
Besides commands, help is also available for:

CTL-C INTRO HInts INput Output PAuses PRegame

Upper case letters mark the shortest acceptable abbreviation.

Commands are:

BAses, BUild, Capture, Images, DOck, Energy, Gripe

Help, Impulse, List, Move, News, PHasers, PLanets,

POints, Quit, RAdio, REpair, SCan, SEt, SHields,

LRscan, STatus, SUmmary, TArgets, TEll, TIme, TOrpedos,

TRactor, TYpe, Users

Enter HELp, PREgame, or blank line:

Once I was into the game I quickly recognized the situation for what it was and with the astuteness of a future star lord summized that I had better get the heck out of the game becuase I was being creamed by some joker from

who-knows-where and I didn't even know the command sequence to get out of the game!!!!! Having figured that out I set about finding the rules so that I might be more successful or at least be able to figure out who's shooting my rear hull full of futuristic buck-shot.

This is where downloading can come in handy. By the way, the Service sells all kinds of documentation for all kinds of system particulars that will enable you to be successful using the system. They seem quite reasonable in price range compared to some system documentation I had to buy when I was in college.

Another thing that I should mention. They have a very interesting system for feedback and complaints which I think is quite good. It's called FEEDBK. You can send messages or ask the system questions or just leave comments/complaints about the system to the sys-ops. While you're doing this all charges are suspended (I love legalese) which makes sense considering you're doing them a favor.

Incidently, through the superboard you can contact a number of other user groups such as the Pascal user group or the CP/M or any of a half dozen other groups. You can send mail across the country. You can do dozens of useful and interesting things. It's all just so incredible I couldn't possibly tell you all the options available. My only hope is that I've peaked your curiosity so that you might try something like this yourself.

If success should be mine (in geting you to try this) then I am pleased. And should you, in fact, get onto the system and into a game of Spacewars or Decwars, then let it be known that, should we be pitted against each other it's no-more-mister-nice-guy, but, every-man-for-himself. Good hacking and drop me a line.

Spencer Koenig
153-27 73 ave
Flushing NY 11367 ■

PRACTICAL BUSINESS PROGRAMS

continued from page 29

The DATA statement in line 1130 inputs the number of rows followed by the number of columns. The DATA statement in line 1140 inputs a 1 for a minimum or 2 for a maximum, the type of problem being solved. The second value in this data statement should be a 0 if you wish to see the work or a 1 for results only.

The next six data statements are the cost or profit data for the six rows specified, put in a line at a time. You will note a total of 13 items must be inputted for all rows.

The next data statement line 1230 are for the capacities and the last data statement in line 1250 is for requirements.

SUMMARY

The transportation method of linear programming is designed to handle from/to types cost and profit problems. The transportation model gets its name from the fact that many applications occur in the shipping business, but is not limited to such problems.

Our program both minimizes costs and maximize profits. Examples of both types were reviewed. Your task as a user is to find problems which fit the transportation model and to set up the data to run your problem.

The task of setting up the transportation model is the one which you must become efficient at. Our examples may be used as guides for seting up transportation problems. It it your job to set up the problem and then to interpret the results.

Steven M. Zimmerman, Ph.D.
College of Business
University of South Alabama
Mobile, Alabama 36688

Leo M. Conrad
Imagineering Concepts
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THE BEALE TREASURE

Gordon Speer

Everyone likes a good yarn, and who hasn't wished for instant wealth from a buried treasure? I can't personally guarantee that this story is true, but a lot of people over the years have been convinced, enough to spend a lot of time searching for the key to the ciphers. So, at the risk of turning a lot of you into treasure junkies, I'll repeat the story just once more. If you want more details, check with your local public library under codes and ciphers. I found this story in no less than three books locally.

Thomas Jefferson Beale was an explorer back in the early 1800's and, along with a group of companions, buried a treasure of gold, silver, and gem stones. I could give you more details but that would spoil the fun you are going to have decoding the second cipher. (If you want to check your maps, Buford's was a tavern in what is now the town of Montvale.) The ciphers were written about 1822. Number one describes the exact location of the treasure, number two describes the method of burial and the contents, and number three names the original owners of the treasure.

Robert Morriss kept the ciphers in a locked box until 1845. Just before he died he gave them to a good friend, James Ward. Ward struggled with them day and night, and found the key to number 2 in the 1860's. Beale had numbered the 1322 words of the Declaration of Independence and encoded the message by using the number of a word beginning with the proper letter. "When in the course of human events..." results in: 1=W, 2=I, 3=T, 4=C, 5=O, 6=H, 7=E, etc.

Those of you who do not have a disk drive and printer will still be able to translate cipher 2, by continuing the numbering of the Declaration of Independence, which you will find in any World Almanac.

Those who want to join in the search for the keys to ciphers 1 and 3, get ready for years of frustration, and realize there may or may not be any gold at the end of this rainbow. (Just in case you are successful, don't forget to send me my share.)

The programs named WRITE1, WRITE2, and WRITE3, will load the original Beale ciphers into sequential files on your disk. FILER will do the same with any text you type. You really need only type a few lines to try any text. Much of the ciphered text contains small numbers and you can easily determine whether or not you should continue.

PROCESS/L1 will substitute the first letter of each word of your trial text in both CIPHER1 and CIPHER3, in the same manner in which CIPHER2 was solved, inserting hyphens where the numbers are beyond the range of the text you typed. If you have a narrow printer you will need to change the 90's in the program to a smaller number, they control the line length of the printed output. If you would like to see the translation of CIPHER2, change either the 1 or 3 to a 2, and type the D of I in with the FILER program.

If you want something else to consider, CIPHER1 not only has some rather large numbers, 2906 compared to 994 and 975 for the other two ciphers, but it also has nearly 60% even numbers, compared to 56% and 53%, which leads me to wonder if Beale was using two letters from each word. PROCESS/L2 will check this out. PROCESS/LET uses each letter of the text, which is certainly another logical possibility.

```
100 'FILER
110 REM WRITES A FILE OF TEXT TO USE TO ATTEMPT DECODING
CIPHER
120 CLEAR 10000
130 DIM T$(200)                'TEXT STRINGS
140 INPUT "NAME OF FILE (T1, T2)";F$
150 PRINT"ENTER TEXT WITHOUT COMMAS (0 TO END)"
160 PRINT"(USE ENTER KEY EVERY TWO OR THREE LINES)"
170 N=N+1
180 INPUT T$(N)
190 IF T$(N)="0" THEN 210
200 GOTO 170
210 OPEN "O",1,F$
220 FOR I=1 TO N-1
230 PRINT #1,T$(I)",";
240 NEXT I
250 PRINT #1,
260 CLOSE 1
```

```
100 'WRITE1
110 DEFINT C,N
120 REM THERE ARE 520 NUMBERS IN CIPHER 1, THE LARGEST IS
2906
130 DATA 71,194,38,1701,89,76,11,83,1629,48,94,63,132,16,111
140 DATA 95,84,341,975,14,40,64,27,81,139,213,63,90,1120,8,15,3
150 DATA 126,2018,40,74,758,485,604,230,436,664,582,150,251,284
160 DATA 308,231,124,211,486,225,401,370,11,101,305,139,189,17
170 DATA 33,88,208,193,145,1,94,73,416,918,263,28,500,538,356
180 DATA 117,136,219,27,176,130,10,460,25,485,18,436,65,84,200
190 DATA 283,118,320,138,36,416,280,15,71,224,961,44,16,401,39
200 DATA 88,61,304,12,21,24,283,134,92,63,246,486,682,7,219,184
210 DATA 360,780,18,64,463,474,131,160,79,73,440,95,18,64,581
220 DATA 34,69,128,367,460,17,81,12,103,820,62,116,97,103,862
230 DATA 70,60,1317,471,540,208,121,890,346,36,150,59,568,614
240 DATA 13,120,63,219,812,2160,1780,99,35,18,21,136,872,15,28
250 DATA 170,88,4,30,44,112,18,147,436,195,320,37,122,113,6,140
260 DATA 8,120,305,42,58,461,44,106,301,13,408,680,93,86,116
270 DATA 530,82,568,9,102,38,416,89,71,216,728,965,818,2,38,121
280 DATA 195,14,326,148,234,18,55,131,234,361,824,5,81,623,48
290 DATA 961,19,26,33,10,1101,365,92,88,181,275,346,201,206,86
300 DATA 36,219,320,829,840,68,326,19,48,122,85,216,284,919,861
310 DATA 326,985,233,64,68,232,431,960,50,29,81,216,321,603,14
320 DATA 612,81,360,36,51,62,194,78,60,200,314,676,112,4,28,18
330 DATA 61,136,247,819,921,1060,464,895,10,6,66,119,38,41,49
340 DATA 602,423,962,302,294,875,78,14,23,111,109,62,31,501,823
350 DATA 216,280,34,24,150,1000,162,286,19,21,17,340,19,242,31
360 DATA 86,234,140,607,115,33,191,67,104,86,52,88,16,80,121,67
370 DATA 95,122,216,548,96,11,201,77,364,218,65,667,890,236,154
380 DATA 211,10,98,34,119,56,216,119,71,218,1164,1496,1817,51
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```
390 DATA 39,210,36,3,19,540,232,22,141,617,84,290,80,46,207,411
400 DATA 150,29,38,46,172,85,194,36,261,543,897,624,18,212,416
410 DATA 127,931,19,4,63,96,12,101,418,16,140,230,460,538,19,27
420 DATA 88,612,1431,90,716,275,74,83,11,426,89,72,84,1300,1706
430 DATA 814,221,132,40,102,34,858,975,1101,84,16,79,23,16,81
440 DATA 122,324,403,912,227,936,447,55,86,34,43,212,107,96,314
450 DATA 264,1065,323,428,601,203,124,95,216,814,2906,654,820,2
460 DATA 301,112,176,213,71,87,96,202,35,10,2,41,17,84,221,736
470 DATA 820,214,11,60,760
480 OPEN "O",1,"CIPHER1"
490 FOR N=1 TO 520
500 READ C
510 PRINT #1,C;
520 NEXT N
530 PRINT #1,
540 CLOSE 1

100 'WRITE2
110 DEFINT C,N
120 REM THERE ARE 763 NUMBERS IN CIPHER2
130 DATA 115,73,24,818,37,52,49,17,31,62,657,22,7,15,140,47,29
140 DATA 107,79,84,56,238,10,26,822,5,195,308,85,52,159,136,59
150 DATA 210,36,9,46,316,543,122,106,95,53,58,2,42,7,35,122,53
160 DATA 31,82,77,250,195,56,96,118,71,140,287,28,353,37,994
170 DATA 65,147,818,24,3,8,12,47,43,59,818,45,316,101,41,78
180 DATA 154,994,122,138,190,16,77,49,102,57,72,34,73,85,35,371
190 DATA 59,195,81,92,190,106,273,60,394,629,270,219,106,388
200 DATA 287,63,3,6,190,122,43,233,400,106,290,314,47,48,81,96
210 DATA 26,115,92,157,190,110,77,85,196,46,10,113,140,353,48
220 DATA 120,106,2,616,61,420,822,29,125,14,20,37,105,28,248,16
230 DATA 158,7,35,19,301,125,110,496,287,98,117,520,62,51,219
240 DATA 37,113,140,818,138,549,8,44,287,388,117,18,79,344,34
250 DATA 20,59,520,557,107,612,219,37,66,154,41,20,50,6,584
260 DATA 122,154,248,110,61,52,33,30,5,38,8,14,84,57,549,216
270 DATA 115,71,29,85,63,43,131,29,138,47,73,238,549,52,53,79
280 DATA 118,51,44,63,195,12,238,112,3,49,79,353,105,56,371,566
290 DATA 210,515,125,360,133,143,101,15,284,549,252,14,204,140
300 DATA 344,26,822,138,115,48,73,34,204,316,616,63,219,7,52
310 DATA 150,44,52,16,40,37,157,818,37,121,12,95,10,15,35,12
320 DATA 131,62,115,102,818,49,53,135,138,30,31,62,67,41,85,63
330 DATA 10,106,818,138,8,113,20,32,33,37,353,287,140,47,85
340 DATA 50,37,49,47,64,6,7,71,33,4,43,47,63,1,27,609,207,229
350 DATA 15,190,246,85,94,520,2,270,20,39,7,33,44,22,40,7,10,3
360 DATA 822,106,44,496,229,353,210,199,31,10,38,140,297,61
370 DATA 612,320,302,676,287,2,44,33,32,520,557,10,6,250,566
380 DATA 246,53,37,52,83,47,320,38,33,818,7,44,30,31,250,10,15
390 DATA 35,106,159,113,31,102,406,229,549,320,29,66,33,101
400 DATA 818,138,301,316,353,320,219,37,52,28,549,320,33,8,48
410 DATA 107,50,822,7,2,113,73,16,125,11,110,67,102,818,33,59
420 DATA 81,157,38,43,590,138,19,85,400,38,43,77,14,27,8,47,138
430 DATA 63,140,44,35,22,176,106,250,314,216,2,10,7,994,4,20,25
440 DATA 44,48,7,26,46,110,229,818,190,34,112,147,44,110,121
450 DATA 125,96,41,51,50,140,56,47,152,549,63,818,28,42,250,138
460 DATA 591,98,653,32,107,140,112,26,85,138,549,50,20,125,371
470 DATA 38,36,10,52,118,136,102,420,150,112,71,14,20,7,24,18
480 DATA 12,818,37,67,110,62,33,21,95,219,520,102,822,30,83,84
490 DATA 305,629,15,2,10,8,219,106,353,105,106,60,242,72,8,50
500 DATA 204,184,112,125,549,65,106,818,190,96,110,16,73,33
510 DATA 818,150,409,400,50,154,285,96,106,316,270,204,101,822
520 DATA 400,8,44,37,52,40,240,34,204,38,16,46,47,85,24,44,15
```

```
530 DATA 64,73,138,818,85,78,110,33,420,515,53,37,38,22,31,10
540 DATA 110,106,101,140,15,38,3,5,44,7,98,287,135,150,96,33
550 DATA 84,125,818,190,96,520,118,459,370,653,466,106,41,107
560 DATA 612,219,275,30,150,105,49,53,287,250,207,134,7,53,12
570 DATA 47,85,63,138,110,21,112,140,495,496,515,14,73,85,584
580 DATA 994,150,199,16,42,5,4,25,42,8,16,822,125,159,32,204
590 DATA 612,818,81,95,405,41,609,136,14,20,28,26,353,302,246,8
600 DATA 131,159,140,84,440,42,16,822,40,67,101,102,193,138,204
610 DATA 51,63,240,549,122,8,10,63,140,47,48,140,288
620 OPEN "O",1,"CIPHER2"
630 FOR N=1 TO 763
640 READ C
650 PRINT #1,C;
660 NEXT N
670 PRINT #1,
680 CLOSE 1

100 'WRITE3
110 DEFINT C,N
120 REM THERE ARE 618 NUMBERS IN CIPHER3
130 DATA 317,8,92,73,112,89,67,318,28,96,107,41,631,78,146,397
140 DATA 118,98,114,246,348,116,74,88,12,65,32,14,81,19,76,121
150 DATA 216,85,33,66,15,108,68,77,43,24,122,96,117,36,211,301
160 DATA 15,44,11,46,89,18,136,68,317,28,90,82,304,71,43,221
170 DATA 198,176,310,319,81,99,264,380,56,37,319,2,44,53,28,44
180 DATA 75,98,102,37,85,107,117,64,88,136,48,151,99,175,89,315
190 DATA 326,78,96,214,218,311,43,89,51,90,75,128,96,33,28,103
200 DATA 84,65,26,41,246,84,270,98,116,32,59,74,66,69,240,15,8
210 DATA 121,20,77,89,31,11,106,81,191,224,328,18,75,52,82,117
220 DATA 201,39,23,217,27,21,84,35,54,109,128,49,77,88,1,81,217
230 DATA 64,55,83,116,251,269,311,96,54,32,120,18,132,102,219
240 DATA 211,84,150,219,275,312,64,10,106,87,75,47,21,29,37,81
250 DATA 44,18,126,115,132,160,181,203,76,81,299,314,337,351,96
260 DATA 11,28,97,318,238,106,24,93,3,19,17,26,60,73,88,14,126
270 DATA 138,234,286,297,321,365,264,19,22,84,56,107,98,123,111
280 DATA 214,136,7,33,45,40,13,28,46,42,107,196,227,344,198,203
290 DATA 247,116,19,8,212,230,31,6,328,65,48,52,59,41,122,33
300 DATA 117,11,18,25,71,36,45,83,76,89,92,31,65,70,83,96,27,33
310 DATA 44,50,61,24,112,136,149,176,180,194,143,171,205,296,87
320 DATA 12,44,51,89,98,34,41,208,173,66,9,35,16,95,8,113,175
330 DATA 90,56,203,19,177,183,206,157,200,218,260,291,305,618
340 DATA 951,320,18,124,78,65,19,32,124,48,53,57,84,96,207,244
350 DATA 66,82,119,71,11,86,77,213,54,82,316,245,303,86,97,106
360 DATA 212,18,37,15,81,89,16,7,81,39,96,14,43,216,118,29,55
370 DATA 109,136,172,213,64,8,227,304,611,221,364,819,375,128
380 DATA 296,11,18,53,76,10,15,23,19,71,84,120,134,66,73,89,96
390 DATA 230,48,77,26,10',127,936,218,439,178,171,61,226,313
400 DATA 215,102,18,167,262,114,218,66,59,48,27,19,13,82,48,162
410 DATA 119,34,127,139,34,128,129,74,63,120,11,54,61,73,92,180
420 DATA 66,75,101,124,265,89,96,126,274,896,917,434,461,235
430 DATA 890,312,413,328,381,96,105,217,66,118,22,77,64,42,12,7
440 DATA 55,24,83,67,97,109,121,135,181,203,219,228,256,21,34
450 DATA 77,319,374,382,675,684,717,864,203,4,18,92,16,63,82,22
460 DATA 46,55,69,74,112,135,186,175,119,213,416,312,343,264
470 DATA 119,186,218,343,417,845,951,124,209,49,617,856,924,936
480 DATA 72,19,29,11,35,42,40,66,85,94,112,65,82,115,119,236
490 DATA 244,186,172,112,85,6,56,38,44,85,72,32,47,73,96,124
500 DATA 217,314,319,221,644,817,821,934,922,416,975,10,22,18
510 DATA 46,137,181,101,39,86,103,116,138,164,212,218,296,815
520 DATA 300,412,460,495,675,820,952
530 OPEN "O",1,"CIPHER3"
540 FOR N=1 TO 618
550 READ C
560 PRINT #1,C;
570 NEXT N
580 PRINT #1,
590 CLOSE 1

100 'PROCESS/LET
110 CLEAR 20000
120 DIM C$(3000)
130 REM USES EVERY LETTER OF TEXT TO DECIPHER
140 INPUT "TEXTFILE NUMBER";T
150 OPEN "I",1,"T"+CHR$(48+T)
160 INPUT #1,A$
170 IF EOF(1) THEN 260
180 A$=" "+A$                    'ADD A LEADING SPACE
190 FOR P=1 TO LEN(A$)-1         'POSITION ACROSS THE STRING
200 IF MID$(A$,P,1)=" " THEN 240
210 N=N+1                        'WORD NUMBER
220 C$(N)=MID$(A$,P,1)           'CHARACTER (NUMBER)
230 IF N > 2906 THEN 260
240 NEXT P
250 GOTO 160
260 CLOSE
270 LPRINT"CIPHER 1 - TEXT "T
280 OPEN "I",1,"CIPHER1"
290 FOR J=1 TO 520
300 INPUT #1,V
310 IF C$(V)="" THEN LPRINT"-"; ELSE LPRINT C$(V);
320 IF J/90=INT(J/90) THEN LPRINT
330 NEXT J
340 LPRINT
350 CLOSE
360 LPRINT"      ":LPRINT"      "
370 LPRINT "CIPHER 3 - TEXT "T
380 OPEN "I",1,"CIPHER3"
390 FOR J=1 TO 618
400 INPUT #1,V
410 IF C$(V)="" THEN LPRINT "-"; ELSE LPRINT C$(V);
420 IF J/90=INT(J/90) THEN LPRINT
430 NEXT J
440 LPRINT
450 CLOSE
460 LPRINT"      ":LPRINT"      "

100 'PROCESS/L1
110 CLEAR 20000
120 DIM C$(3000)
130 REM USES THE FIRST LETTER OF EACH WORD IN TEXT TO DECODE
CIPHER
140 INPUT "TEXTFILE NUMBER";T
150 OPEN "I",1,"T"+CHR$(48+T)
160 INPUT #1,A$
170 IF EOF(1) THEN 250
180 LET A$=" "+A$                'ADD A LEADING SPACE
190 FOR P=1 TO LEN(A$)-1         'POSITION ACROSS THE STRING
200 IF MID$(A$,P,1)<>" " OR MID$(A$,P+1,1)=" " THEN 230
210 N=N+1                        'WORD NUMBER
220 C$(N)=MID$(A$,P+1,1)         'CHARACTER (NUMBER)
230 NEXT P
240 GOTO 160
250 CLOSE
260 LPRINT "CIPHER 1 - TEXT"T
270 OPEN "I",1,"CIPHER1"
```

```
280 FOR J=1 TO 520
290 INPUT #1,V
300 IF C$(V)="" THEN LPRINT"-"; ELSE LPRINT C$(V);
310 IF J/90=INT(J/90) THEN LPRINT
320 NEXT J
330 LPRINT
340 CLOSE
350 LPRINT"      ":LPRINT"      "
360 LPRINT "CIPHER 3 - TEXT"T
370 OPEN "I",1,"CIPHER3"
380 FOR J=1 TO 618
390 INPUT #1,V
400 IF C$(V)="" THEN LPRINT"-"; ELSE LPRINT C$(V);
410 IF J/90=INT(J/90) THEN LPRINT       'END PRINTER LINE
420 NEXT J
430 LPRINT
440 CLOSE
450 LPRINT"      ":LPRINT"      "

100 'PROCESS/L2
110 CLEAR 20000
120 DIM C$(3000)
130 REM USES THE FIRST TWO LETTERS OF EACH WORD
140 INPUT "TEXTFILE NUMBER";T
150 OPEN "I",1,"T"+CHR$(48+T)
160 INPUT #1,A$
170 IF EOF(1) THEN 260
180 LET A$=" "+A$              'ADD A LEADING SPACE
190 FOR P=1 TO LEN(A$)-1       'POSITION ACROSS THE STRING
200 IF MID$(A$,P,1)<>" " OR MID$(A$,P+1,1)=" "THEN 240
210 N=N+2
220 C$(N-1)=MID$(A$,P+1,1):C$(N)=MID$(A$,P+2,1)
222 IF C$(N)=" " THEN C$(N)=C$(N-1)
230 IF N > 2906 THEN 260
240 NEXT P
250 GOTO 160
260 CLOSE
270 LPRINT"CIPHER 1 - TEXT "T
280 OPEN "I",1,"CIPHER1"
290 FOR J=1 TO 520
300 INPUT #1,V
310 IF C$(V)="" THEN LPRINT"-"; ELSE LPRINT C$(V);
320 IF J/90=INT(J/90) THEN LPRINT
330 NEXT J
340 LPRINT
350 CLOSE
360 LPRINT"      ":LPRINT"      "
370 LPRINT "CIPHER 3 - TEXT "T
380 OPEN "I",1,"CIPHER3"
390 FOR J=1 TO 618
400 INPUT #1,V
410 IF C$(V)="" THEN LPRINT "-"; ELSE LPRINT C$(V);
420 IF J/90=INT(J/90) THEN LPRINT
430 NEXT J
440 LPRINT
450 CLOSE
460 LPRINT"      ":LPRINT"
```

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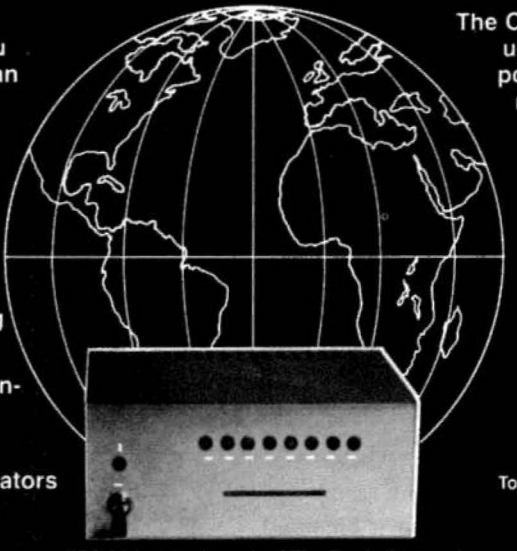

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MODEL III CORNER

Hubert S. Howe, Jr.

This Month: Cassette Input and Output

Transferring data between memory and the cassette tape recorder is similar to reading the keyboard or displaying characters on the video monitor. It is not really necessary for a programmer to know how such a transfer works, as long as he knows how to use the ROM subroutines that carry out the essential operations. One important difference between the keyboard and video display of the TRS-80 Model 3 on the one hand, and the cassette recorder on the other, is that the former are memory mapped, whereas the cassette recorder is interfaced through an input/output port, number 255 (hexadecimal FF). Turning the motor on and off is handled through port 236 (EC hex), bit 1. (The reader is advised against outputting values to this port without going through the system, since it also handles several other functions, including enabling and disabling the I/O bus, video waits, the alternate character set, and the 32-character mode.) Only certain bits of this port are used. The disks and line printer also use ports, as do the RS-232-C interface and various other peripherals. The TRS-80 has much room for expansion of input and output devices using either method.

Cassette ROM Subroutines

The addresses of ROM subroutines that are used for cassette input and output are summarized in Table 1. All are located between addresses 01D9H and 0313H, but actually branch to the area above 3000H. ("H" is often appended to addresses to remind you that they are hexadecimal numbers.)

Address	Function
01F8H	Turns cassette off. Uses register A.
0235H	Read byte, which is returned in A. Uses no other registers.
0264H	Write byte in A to cassette. Uses no other registers.
0287H	Write leader and sync byte. Turns on motor. Uses AF, C.
0296H	Read leader and sync byte. Turns on motor. Uses AF. Two asterisks appear in the upper right corner of the video display when leader and sync byte are found.

Table 1: Summary of cassette ROM routines.

All cassette input and output operations in assembly language can be done using these subroutines. All standard tape formats are readable. (Some programmers have developed non-standard methods that encode the bits in some different way. These operations are beyond the scope of this discussion.)

The beginning of a file on the cassette tape is signified by a "leader and sync byte," which is actually a succession of 255 zeros followed by A5 (the sync byte). Each bit of data is read from the tape separately. This means that the timing of the routine that reads the bits is extremely crucial. This is why you must disable interrupts (CMD"T") in Disk Basic when reading cassettes. It is also why TRS-80 owners who have had the clock speed modified must switch to the older, slower speed in order to read standard cassette tapes.

Once the cassette tape is turned on and the leader and sync byte located or written, it is the programmer's responsibility to keep up with the speed of the cassette in order to read or write data properly. (Writing data may be less crucial than reading it.) The data-transfer speed of the cassette is either 500 or 1500 baud ("baud" means "bits per second"), so that a bit must be read or written every 2 milliseconds for 500 baud and every 2/3 millisecond for 1500 baud. What this means is that, for most purposes, all you can do is to read or write data into or out of memory and stop the cassette when you want to do some computation. Each time you stop the cassette, you must start it again with a leader and sync byte combination, to make sure that no data is lost due to the start and stop motion of the cassette. Any program that does not keep up with the baud rate will lose bits of data, thus reading incorrect values.

The TRS-80 Model 3 has two cassette speeds, which are indicated by the value in memory location 16913 (4211H): zero indicates low speed (500 baud), and any other value indicates high speed (1500 baud). Actually, the computer uses many other RAM locations as well. Location 420CH contains the address of the tape writing subroutine, and 420EH the tape reading subroutine. These values are set when the leader and sync routines are called, which check location 4211H for zero and act accordingly.

If the high cassette speed is being used, the computer requires an interrupt to enter and exit the routine. This is not required by the low cassette speed. What this means is that the break vector at location 400CH and the interrupt vector at 4012H must be restored to a JP instruction for a high speed cassette read operation, in case it had been changed, but not for a low speed read. Finally, on the Model 3 it is possible to terminate a cassette read operation by pressing the BREAK key. If BREAK is typed, the computer jumps to location 4204H, so this location needs to be set to the address where you want your program to resume should you type BREAK.

Tape Formats

Standard tape formats have been developed by Radio Shack to indicate what the data on the tape represents, where it goes, when to stop the cassette, and what to do after stopping. There are four standard tape formats: Basic programs, Basic data, machine-language object tapes (the SYSTEM format), and Editor/Assembler symbolic program

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files. Other formats, such as data files for the Visicalc program, have been devised for various reasons, but will not be discussed here.

1. Machine Language Object (SYSTEM) Tapes

An "object program" is a program in machine code ready to run on a computer. When stored on an external medium such as a cassette tape, it is necessary only to dump it into memory and jump to the starting location.

The object-program format is also known as the SYSTEM format because of the Basic command used to read such tapes. Data is written on the tape in the form of blocks less than 256 bytes in length. Each block begins with a header byte identifying what kind of block it is. There are three types of blocks: FILENAME, DATA, and ENTRY. FILENAME is first, followed by any number of DATA blocks. The ENTRY block comes last, after which the cassette is turned off. The whole tape has the structure shown in Table 2.

The fact that each data block has its own address means that data can be loaded anywhere in memory, and that the same tape can contain data that goes into several different areas. Usually, only the Editor/Assembler program produces such tapes (through the use of different ORG statements), because monitors such as TBUG or Monitors 3 and 4 (as well as the TAPEDISK utility program) require that you specify one contiguous block. If the checksum is wrong, or if the header byte is not 55, 3C, or 78, an error is produced. If reading the cassette under SYSTEM, a "C" replaces one of the asterisks in the upper right corner.

(Leader and Sync Byte)	
Filename Header	55H
File Name	6 bytes (ASCII), filled with blanks if name less than 6 characters.
Data Header	3CH
Count Byte	Number of data bytes to follow (1-256)
Load Address	2 bytes, LSB/MSB, indicating where data is to be loaded
(Other Data Blocks)	
Entry Header	78H
Entry Address	2 bytes, LSB/MSB

Table 2: Object program cassette format.

2. Editor/Assembler Source Program Tapes

Source tapes for the Editor/Assembler program have a format different from other tapes, which is summarized in Table 3. Following the leader and sync bytes, there is an ID byte (D3) and the six-byte name of the tape. Following the name, individual statements occur in separate blocks until the endfile byte 1AH is reached.

This format is essentially a dump of the memory area that holds the source program when running the Editor/Assembler program, except that when the program resides in memory, the line numbers are stored in two bytes (LSB/MSB). The tape thus takes more room than the

(Leader and Sync Byte)	
Filename Header	D3H
File Name	6 bytes (ASCII), padded with blanks
Individual program statements:	
Line Number	5 bytes, ASCII-encoded, with bit 7 (parity) set
Statement Code	(Any length). TAB (right arrow) key encoded as Ø9.
Carriage Return	ØD (ENTER key)
(Last statement - END -	encoded in same manner)
End Byte	1AH (shift down-arrow)

Table 3: Editor/Assembler source cassette tape format.

program in memory. This is also the format used to hold symbolic files on disk.

3. Level II Basic Program Tapes

A Level II Basic program tape is essentially a dump of the program as it is stored in memory. This is not the way in which you type it in, nor the way it is listed when you print it, because all of the key words are translated into a binary code. Statement numbers are stored in two bytes. This is why they may have a maximum value of 65529 (65535 less a few values used for special purposes). The only recognizable data is the ASCII text in PRINT statements, variable names, and constants. The complete format is shown in Table 4.

(Leader and Sync Byte)	
Header	D3 D3 D3
File Name	First byte only, ASCII
Program Statements	Starts loading directly into 42E9H (Level II) or 68BAH (Disk Basic)
End Flag	ØØ ØØ ØØ

Table 4: Format for BASIC program tapes.

This is also the standard format used to store Basic programs on disk, except that disk storage also provides the "ASCII" option (SAVE "PGM",A), which stores the program in exactly the same way that it is printed by a LIST command.

4. Electric Pencil and SCRIPSIT Data Tapes

While the data saved by the Electric Pencil and SCRIPSIT word-processing programs are different (SCRIPSIT sets bit 7 for many data bytes), the tape formats are the same, so that data prepared from one program can be used with the other. There are no header bytes or names on the tape. Data are simply saved in blocks, where the first byte is the length (1-256, with zero indicating 256), the next bytes are data, and the last byte is a checksum. The end of file is recognized by a data value of zero for the last byte in the block. This information is summarized in Table 5.

(Leader and sync bytes)	
Block length (1-256)	
Data Bytes (as many as in length)	
Checksum	
Last byte = zero to end file	

Table 5: Format for Electric Pencil and SCRIPSIT data tapes.

5. Level II Basic Data Tapes

Because of the one important point mentioned above - that you must write a new leader and sync byte each time that you start or stop the cassette — Level II Basic data tapes are stored in a very inefficient manner. Each time a Print #-1 or INPUT #-1 is executed, a new leader and sync byte is written or read. A Basic program can take advantage of this situation, by trying to include as much data as possible within a single statement, but it is impossible to escape the fact that most of the time is spent reading the leader and sync bytes. To compound this problem, all data tapes are written at low speed (500 baud), regardless of what is specified in location 16913.

The exact format of a data tape is so simple that a table is not necessary. After the leader and sync byte comes the data itself, terminating in a carriage return. Individual items in the list are separated by commas. For this reason a comma cannot be included in a string saved on cassette tape (nor can a carriage return). Strings are written simply as a series of characters. All numbers, whether they represent integers or single- or double-precision values, are stored as ASCII strings surrounded by blank spaces. Thus, a number could be written as an integer and read as a single- or double-precision number or string. The decimal point is included if present. A string consisting of numerals can be written as a string and read as a number, but if it contains any non-numerical characters, an error is produced. The warning in the LEVEL II BASIC REFERENCE MANUAL is not totally correct. It is possible to read data in some form other than that in which it was written, but you must always read the same number of items. The carriage-return character (0DH) is the cue to stop the cassette when data is being read. ■

INFORMATION RETRIEVAL SYSTEM

continued from page 18

article in the November 1979 issue of the Radio Shack Microcomputer News for the description of the program. I have made some minor changes to the program but the body of the program is basically the same.

```
1Ø ' FROM "LIST/BAS"
2Ø ' FROM RADIO SHACK MICROCOMPUTER NEWSLETTER, 11/79
3Ø ' LISTER/BAS 2.Ø - BASIC PAGE LISTER
4Ø ' COPYRIGHT (C) 1979 TANDY CORP.
5Ø ' MODIFIED BY PETER ANSBACHER, 918 SOUTH RUSTIC ROAD,
COLUBMIA, MO  652Ø1
6Ø ' MAY 1, 1981
7Ø '
8Ø CLEAR 1ØØØ
```

```
90 DEFINT A-Z
100 '
110 ' ATTEMPT TO OPEN REQUESTED FILE; ERROR TRAP IF NOT FOUND
120 '
130 CLS : PRINT TAB(20) "BASIC PAGE LISTER 2.0" : PRINT
140 LINE INPUT "ENTER FILESPEC: " ; F$
150 ON ERROR GOTO 960 : OPEN "I", 1, F$
160 ON ERROR GOTO 990 : PG = 0 ' PAGE COUNT SET TO ZERO
170 '
180 LINE INPUT "ENTER TITLE: " ; TL$
190 LINEINPUT "ENTER TIME AND DATE: " ; DT$
200 LINE INPUT "ENTER PAGE WIDTH ( 64 TO 132, DEFAULT = 80 ):
" ; WD$
210 IF  WD$ = ""  THEN  WD$ = "80"
220 WD = VAL( WD$ )
230 IF  WD < 64  OR  WD > 132  THEN  PRINT "* BAD WIDTH (64 -
132 ONLY) *" : GOTO 200
240 INPUT "DO YOU WANT EACH 'STATEMENT' ON A SEPARATE LINE
(Y/N)" ; SL$
250 IF  LEFT$( SL$, 1 ) = "Y"  THEN  F1 = 1  ELSE  F1 = 0
260 PRINT : INPUT "TYPE 1 FOR SINGLE SPACE, 2 FOR DOUBLE" ;
SP
270 '
280 ' ** MAKE SURE THE PRINTER IS READY ***
290 '
300 GOSUB 1030 ' SEE IF WANT TO PRINT LINE NUMBERS
310 PRINT : PRINT "SET PRINT HEAD OVER PERFORATIONS,"
320 PRINT : LINE INPUT "TURN ON PRINTER - THEN PRESS <ENTER>"
; A$
330 IF  PEEK(14312) > 127  THEN  PRINT "* PRINTER NOT READY
*" : GOTO 310
340 POKE 16424, 67 : POKE 16425, 1 ' SET LINE/PAGE AND LINE
COUNT
350 GOSUB 1220 ' GET LINE AND ADD LINE NUMBERS
360 GOSUB 660 : GOTO 410
370 GOSUB 660
380 IF  EOF( 1 )  THEN  560
390 GOSUB 1220 ' GET LINE AND ADD LINE NUMBERS
400 IF  F1 = 1  THEN  GOSUB 670 : GOTO 380
410 W1 = WD : T = 0
420 W = W1 : IF  LEN( L$ ) < W  THEN  W = LEN( L$ )
430 J = INSTR( L$, CHR$(10) ) ' CHECK FOR LINEFEED
440 IF  J > 0  THEN  W = J - 1  ELSE  IF  LEN( L$ ) > W1
THEN  J = -1
450 LPRINT TAB(T) ; LEFT$( L$, W )
460 IF  J <> 0  AND  T = 0  THEN  T = 5 : W1 = W1 - T
470 IF  SP = 2  THEN  LPRINT " " ' DOUBLE SPACE
480 IF  J > 0  THEN  W = W + 1
490 L$ = RIGHT$( L$, LEN(L$ ) - W )
500 IF  L$ = ""  THEN 530
510 IF  PEEK( 16425 ) > 62  THEN  LPRINT CHR$(12) : GOSUB 660
520 GOTO 420
530 IF  PEEK( 16425 ) < 63  THEN  380  ' PAGE FINISHED?
540 LPRINT CHR$(12)
550 IF EOF(1)  THEN  570  ELSE  370
560 LPRINT CHR$(12)  ' ALL DONE
570 PRINT : PRINT "* END-OF-LISTING *"
580 PRINT
590 PRINT "SKIP TO TOP OF NEXT PAGE, ( <ENTER> = YES, N =
NO ) ?" ;
```


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```
600 LINE INPUT A$
610 IF  A$ = ""  THEN  LPRINT CHR$(12)
620 END
630 '
640 ' ** PRINT DASH AND HEADING **
650 '
660 GOSUB 820 : GOSUB 860 : RETURN
670 NN = 0 : FOR J = 1 TO LEN( L$ ) : V$ = MID$(L$, J, 1 ) :
L = L + 1
680 LPRINT V$ ;
690 IF  L >= WD  THEN  LPRINT " " : GOSUB 770 : LPRINT
TAB( 10 ) ; : L = 10
700 IF  V$ = CHR$(34)  AND  NN = 1  THEN  NN = 0 : GOTO 720
710 IF  V$ = CHR$(34)  AND  NN = 0  THEN  NN = 1
720 IF  V$ = ":"  AND NN <> 1  THEN  LPRINT " " : GOSUB 770 :
LPRINT TAB( 5 ) ; : L = 5
730 NEXT J
740 LPRINT " " : L = 0
750 GOSUB 770
760 RETURN
770 IF  PEEK( 16425 ) > 62  THEN  LPRINT CHR$(12) : GOSUB 660
780 RETURN
790 '
800 ' *** PRINT DASHED LINES FOR PERFORATIONS ***
810 '
820 LPRINT STRING$( 1, " " ) : GOSUB 920 : RETURN
830 '
840 ' *** PRINT HEADING AND PAGE NUMBER ***
850 '
860 LPRINT LEFT$( TL$ + STRING$( 30, 32 ), 30 ) ; "    " ;
DT$ ; "    " ;
870 PG = PG + 1 : LPRINT USING "PAGE ###" ; PG
880 LPRINT STRING$( WD, "=" )
890 '
900 ' *** PRINT TWO BLANK LINES ***
910 '
920 LPRINT " " : LPRINT " " : RETURN
930 '
940 ' ***  ERROR TRAPPING ***
950 '
960 IF  ERR / 2 + 1 = 54  THEN  PRINT "* FILE NOT FOUND *" :
RESUME 140
970 IF  ERR / 2 + 1 = 65  THEN  PRINT "* BAD FILE NAME *" :
RESUME 140
980 PRINT : PRINT "ERROR #" ; ERR / 2 + 1 ; "IN LINE" ; ERL :
STOP
990 RESUME
1000 '
1010 '**********
1020 '
1030 ' SEE IF WANT TO PRINT LINE NUMBERS
1040 '
1050 PRINT
1060 PRINT "PRINT LINE NUMBERS FROM 1 TO N FOR EACH LINE
(Y/N) ? " ;
1070 LINE INPUT YN$
1080 LN = 0
1090 IF  YN$ <> "Y"  THEN  GOTO 1180
1100 PRINT
1110 PRINT "NOTE:  1 = PRINT LINE NUMBERS AT BEGINNING OF
LINE"
1120 PRINT "       2 = PRINT LINE NUMBERS AT END OF LINE"
1130 PRINT
1140 PRINT "       SELECT " ;
1150 INPUT LN
1160 IF  LN < 0  OR  LN > 2  THEN  1100
1170 LL = 0 ' LINE NUMBER TO PRINT
1180 RETURN
1190 '
1200 '**********
1210 '
1220 ' GET LINE AND ADD LINE NUMBER
1230 '
1240 LINE INPUT #1, L$
1250 IF  LN = 0  THEN GOTO 1330
1260 LL = LL + 1 ' INCREMENT LINE NUMBER
1270 IF  LN = 2  THEN  1320
1280 ' ADD LINE NUMBER TO BEGINNING OF LINE
1290 L$ = "<" + STR$(LL) + "> " + L$
1300 GOTO 1330
1310 ' ADD LINE NUMBER TO END OF LINE
1320 L$ = L$ + " <" + STR$( LL ) + ">"
1330 RETURN
1340 '
1350 '**********
1360 '
```

How to Modify the SORT Program to Run in 32K

The SORT program is designed to run in 48K. If your computer has 32K, you can make the following changes to enable the program to run on your computer:

1. Set Memory Size to 48895.
2. Change the following lines in the program to:

```
170 CLEAR 15000
190 DIM A$(1000)
680 DEFUSR = &HBF00
740 POKE I7 - 16641, I8
760 IF I6 <> THEN STOP
```

3. Change all 23 occurrences of 255 to 191 in the data statements.

Note: It is not practical to run this program in 16K of memory. However, if you want to try to get it to work, make the following changes:

1. Set Memory Size to 32512.
2. Change the following lines in the program to:

```
680 DEFUSR = &H7F00
740 POKE I7 - 32511, I8
760 IF I6 >< 22393 THEN STOP
```

3. Change all 23 occurrences of 255 to 127 in the data statements.
4. Change line 170 to clear enough string space. Experiment with this value.
5. Change line 190 to dimension A$ to the maximum number of lines allowed. Experiment with this value.

Peter Ansbacher
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Columbia, MO 65201 ■

I's, J's AND THEIR RELATIONSHIP TO BASEBALL

C. Brian Honess

As I write this article, baseball is back on the TV, and I think that baseball will make a terrific example program to illustrate working with a matrix and with subscripts. In fact, it doesn't really have to be major league baseball, it can be your local Little League, or it doesn't even have to be baseball — we can work with most any sport wherein we're interested in the percentage standings, and the number of games behind the leader each of the various teams is.

Let's make up some names of Little League teams, say 10 of them, along with as team number, and let' see how they might stand as of this morning:

TEAM NAME	NUMBER	WON	LOST	PERCENT	GAMES BEHIND
EAGLES	6	13	5	.722	
TIGERS	1	11	6	.647	1 1/2
RABBITS	7	11	7	.611	2
TURTLES	1Ø	11	8	.579	2 1/2
BEARS	3	9	1Ø	.474	4 1/2
LIONS	2	8	9	.471	4 1/2
BIRDS	8	8	1Ø	.444	5
CAMELS	9	8	11	.421	5 1/2
MULES	5	7	11	.389	6
SNAILS	4	3	12	.2ØØ	8 1/2

You'll notice that the number of games played by each of the teams varies between 15 and 19. Now, let's consider the games that were played tonight. All 10 teams played, and all 5 games were completed — none rained out, and we'd like to update our standings table.

TEAM & NO.	RUNS	VS.	TEAM & NO.	RUNS
TIGERS 1	6		BIRDS 8	1
SNAILS 4	4		TURTLES 1Ø	1
BEARS 3	5		LIONS 2	3
MULES 5	3		CAMELS 9	1
EAGLES 6	3		RABBITS 7	2

So, team 1 beat team 8 by a score of 6 to 1; team 4 beat team 10 by a score of 4 to 1, etc.

In order to find the "win/loss percentage" for a particular team, we need only calculate:

$$\frac{\text{No. of wins}}{\text{No. of wins + No. of losses}}$$

but the calculation for the number of games a particular team is behind the leader, is a little more difficult:

$$GB_j = \frac{(W_1 - L_1) - (W_j - L_j)}{2}$$

which means: to find the number of games behind, that the "j"th team is, we take the difference between their wins and losses, and subtract this from the difference between the wins and losses for the first place team, and then divide by 2. For example, consider our starting standings on the previous page, and say we want to find out how many games behind the CAMELS are, team 9.

$$GB_9 = \frac{(W_1 - L_1) - (W_9 - L_9)}{2} = \frac{(13 - 5) - (8 - 11)}{2}$$

$$= \frac{8 - (-3)}{2} = \frac{8 + 3}{2} = 5\tfrac{1}{2}$$

which is what the standings say!

The inputs to the program will be the old standings, plus the results of the games played since the standing were last updated. When the old standings are entered, all we need to enter is the team number and the number of games won and lost for each team, since we'll have no need for the old percentage wins, and games behind figures. Then we'll enter the number of games involved in our update run, and then enter the teams playing and the scores of each game, and then calculate and display a new standings table.

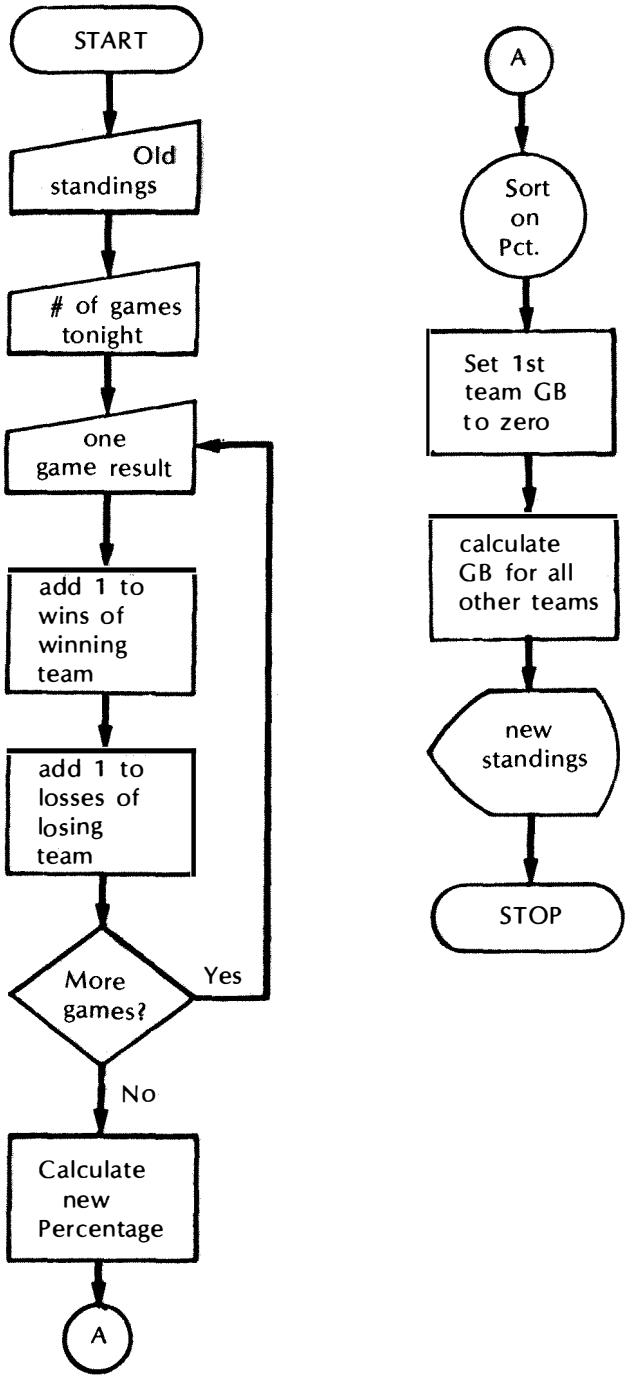
The rough flowchart shows the order in which we'll do these tasks. I'm showing everything being "keyed" in (note the shape of the "keyboard" symbol), but you could just as well use DATA statements to READ in the old standings, etc. Also, I show the new table being displayed on a CRT (note the "tube" symbol), but you may be fortunate enough to own a printer, and you might even want to write the table onto disk, so it can be used as input for the next update run. The same thing could, of course, be done with a tape cassette.

Let's start by DIMensioning a 10 by 3 table for the old standings (just the team number, and the number of wins and losses for each of the 10 teams).

```
20 DIM T(10,3)
```

Now we'll load it with our old standings. There are many ways to do this — you could INPUT them a row at a time, or a column at a time — or you could READ them, using DATA statements. I'll do it that way (for absolutely no particular reason):

```
25 FOR I = 1 TO 1Ø
3Ø READ T(I,1), T(I,2), T(I,3)
35 NEXT I
41 DATA 6,13,5
42 DATA 1,11,6
43 DATA 7,11,7
44 DATA 1Ø,11,8
45 DATA 3,9,1Ø
```



"Rough" flowchart for updating standings, for any number of teams, playing any number of games between update runs.

```
46 DATA 2,8,9
47 DATA 8,8,10
48 DATA 9,8,11
49 DATA 5,7,11
50 DATA 4,3,12
```

Now we'll have to find out how many games are involved in the update run:

```
55 INPUT ""HOW MANY GAME RESULTS DO YOU WANT TO ENTER"";N
```

and we'll INPUT them (assuming the winning team is listed first), and increment the correct "win" and "loss" totals:

```
60 FOR I = 1 TO N
65 INPUT T1, T2
67 FOR J = 1 TO 10
68 IF T(J,1) <> T1 THEN 70
69 X = J
70 NEXT J
71 T(X,2) = T(X,2) + 1
72 FOR J = 1 TO 10
73 IF T(J,1) <> T2 THEN 75
74 X = J
75 NEXT J
76 T(X,3) = T(X,3) + 1
77 NEXT I
```

Now it's time to calculate the new percentages, and then the games behind figures, but wait a minute — where will we put them? How about in the same table, in a 4th and 5th column? A good idea, so let's just go back and change line 20, to reflect the fact that we need a 10 by 5 table:

```
20  DIM T(10,5)
```

Now we can calculate the percentages:

```
85 FOR I = 1 TO 10
90 T(I,4) = T(I,2) / (T(I,2) + T(I,3))
95 NEXT I
```

Now, the standings may have changed, by virtue of the update, so let's sort the table before we print it, using the newly-calculated percentages as a basis for the sort.

There are a number of variations of a sorting technique called the "bubble-up" or "push-up" sort. Basically, what we'll be doing is going through the list of percentages and comparing the first one with each of the other nine, in turn. When we find one that is larger than the first one, we'll simply switch them, so that the largest one in the list will therefore "bubble-up" to the top. Then we'll go through the list starting with the second number, and compare it with each of the other eight numbers in turn, "pushing-up" the largest one — and then starting with the third one, etc. down through the ninth, we'll swap them, and the list will be sorted.

The only real difficulty is that we can't switch two numbers in storage without using a third temporary location. This is because if we want to switch two numbers, and we bring the second number into the location occupied by the first number, it will destroy the first number when we try to retrieve it to put it into the second location! For this reason, I'll set up four temporary storage locations, X1, X2, X3 and X4, to hold the four numbers in any one row of the table when we want to make a switch. Here then, is the sort routine:

```
100 FOR I = 1 TO 9
105 JJ = I + 1
```

```
11Ø FOR J = JJ TO 1Ø
12Ø IF T(I,4) > T(J,4) GO TO 19Ø
13Ø X1 = T(I,1)
135 X2 = T(I,2)
14Ø X3 = T(I,3)
145 X4 = T(I,4)
15Ø T(I,1) = T(J,1)
155 T(I,2) = T(J,2)
16Ø T(I,3) = T(J,3)
165 T(I,4) = T(J,4)
17Ø T(J,1) = X1
175 T(J,2) = X2
18Ø T(J,3) = X3
185 T(J,4) = X4
19Ø NEXT J
195 NEXT I
```

Line 100 tells us which line of the table we're going to use for comparing to all the other lines, and line 105 simply says to start comparing with the next line in the table, after the one you're comparing, because there is no sense going up and comparing with higher lines that have already been considered, and "bubbled-up"! If the line we're comparing is already larger, line 120 says to not bother doing any switching, and to go to the loop bottom and then consider the next comparison. Lines 130 through 185 are the 12 moves that it takes to switch places with the two lines of four items each, using the four temporary locations.

And now, we're ready to calculate the "games-behind" values, which go in the 5th column of the Table T. First, though, we'll set the first team to zero.

```
2ØØ T(1,5)=Ø
2Ø5 FOR I=2 to 1Ø
21Ø T(I,5)=((T(1,2)-T(1,3)) - (T(I,2)-T(I,3))) / 2
215 NEXT I
```

And now we can PRINT the results:

```
23Ø FOR I=1 TO 1Ø
235 PRINT T(I,1);T(I,2);T(I,3);T(I,4),T(I,5)
24Ø NEXT I
25Ø END
```

Let's try a RUN, with the test data from the first part of the article. When you're asked for the number of games, enter 5. Then enter:

```
? 1,8
? 4,10
? 3,2
? 5,9
? 6,7
```

which corresponds to the numbers of the winning and losing teams, respectively, for each of the 5 games played. We have not used very fancy output formatting, so the results should be the following values:

```
6    14    5    .736842    Ø
1    12    6    .666667    1.5
7    11    8    .578947    3
1Ø   11    9    .55ØØØØ    3.5
3    1Ø    1Ø   .5ØØØØØ    4.5
2    8     1Ø   .444444    5.5
5    8     11   .421Ø53    6
8    8     11   .421Ø53    6
9    8     12   .4ØØØØØ    6.5
4    4     12   .25ØØØØ    8.5
```

and if you compare this table to the original, you'll see there have been a few changes.

There are several changes and additions we can make in the program. In line 65, we could input the two teams that played, T1 and T2, as well as the two scores, call them R1 and R2, and then have the program update the won/lost columns of th correct teams. Instead of using team numbers, you could modify the program to use the team names. And, you might add a little nicer output print format for the table. How about if I leave the first two to you, and I'll tackle the output formatting?

Let's add the following lines to the program. Notice that some of the existing lines will be overlaid, but this is OK, as I've adjusted all the line numbers.

(Program on page 54)

When you run this, you'll agree that there has been a real

text continued on page 55

POCKET COMPUTER CORNER

A Retail Package for the Pocket Computer

S. M. Zimmerman, Ph.D., and L. M. Conrad

Copyright © Zimmerman and Conrad, 1982

The ability to package program routines with the pocket computer can be of value to the retail merchant. This collection of programs includes:

1. DISC—A routine for discounting a sale from a given price.

2. GPM—This gross profit margin routine uses the selling price as the base for profit calculations

3. MARKUP—This routine uses costs as the base for profit calculations

4. TAX—This routine is designed to calculate sales tax information.

The low power memory of the pocket computer means the merchant may load the programs into the computer and have them available whenever they are needed.

We used PRINT statements in our pocket computer to produce the output. This means the user has the choice of using the display followed by an ENTER or the printer if one is available.

The theory for all routines used is simple. We will briefly review the theory and equations used in one of the routines. The operation of the program will then be reviewed, followed by a brief discussion detailing our program.

THEORY . . . DISC

The sales price of an item may be calculated by the following relationships:

sales price = price - discount * price

In the above equation the discount must be a decimal.

Working backwards the price may be calculated with the following relationship:

price = sales price / (1 - discount)

Again the discount must be expressed as a decimal.

The last equation used in this routine is for the purpose of calculating the discount as a percent. The equation used follows:

discount = (Price - sales price) / price * 100.

The result of this equation is to produce the discount as percent with the original price as a base.

THEORY . . . GPM (Gross Profit Margin)

One advantage of this approach is that the selling price is used as its base of calculations. This is the same base which is used for discounting above. By using the same base in these two routines the merchant has an easier time in figuring the amount of discount he can allow in any given circumstance.

Equations used for this routine are:

gross profit margin = (price - cost) / price * 100

cost = price - gross profit margin * price

price = cost / (1 - gross profit margin)

In all the above equations the gross profit margin is inputted as a decimal. The value is outputted from the first equation as a percentage.

THEORY . . . MARKU

This approach uses the cost of a item as its base. Using this method of calculating selling price is not popular because it is more difficult and subject to potential costly errors.

Equations used in this routine are:

markup = (price / cost -1) * 100

cost = price / (markup + 1)

price = cost + markup * cost

The value of markup is inputted as a decimal in all the equations. The value of markup in the first equation is outputted as a percentage.

THEORY . . . TAX

Sales tax is widely used and understood. We included this routine in our program for completeness. The equations are:

tax = tax rate * price

gross price= price + tax

tax rate = (gross price - price) / price * 100

price= gross/ (1 + tax rate * gross price)

The above equations are straightfoward except for the calculation of price. This is to be expected, in that price is the base of the calculations. We have defined gross price as the price of the item plus the tax. The tax rate is inputted in terms of a decimal and outputted as a percentage.

RUNNING the PROGRAM

The program is designed to be operated in the RUN and the DEFinable MODEs. In either MODE the program may be started by typing RUN or RUN "RETAIL". The main menu appears on the display as:

DISC GPM MARKUP TAX?

To select an item from this menu the user types the name desired. For example, to figure the gross profit margin one would type GPM.

It is possible to go to any one of the alternative routines. For example; if you type RUN "GPM" you will go directly to the gross profit margin routine without going through the main menu. This ability will be advantageous in speeding up the program for individuals who make extensive use of the program.

Let's review the operations of each alternate routine in turn.

RUN "DISC"

The menu for this routine is:

PRICE DISC% SALE?

You must now select the item you wish to solve for. If you are interested in PRICE then type PRICE and hit ENTER. The result will be:

DISC% SALE?

You are being asked to input the value for discount as a percentage followed by the sales price. Assume the discount is 10% type 10 and hit ENTER. You will now see:

?

If the sales price is $50.00 you should type 50 and hit the ENTER key. The outputs are:

PRICE 55.55555556
SALE 50.
DISC% 10.%

If you are using a printer, the three items will be produced automatically. If you are using the display, you will have to hit the ENTER key between results.

We did not include a routine to round off the output values. We felt that users would prefer to see the actual number and to make the round off-truncation decision themselves.

After the computer has completed the above output the main menu will again appear on the display. In our design of the program we decided to allow the option of having the flow return to the main menu or to the working menu for the section being used. We will show you how to rewrite the program to have it perform in the manner you prefer in the section reviewing the program.

If you selected DISC% in the working menu you will see:

PRICE SALE?

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Assume you answer 55.55 and 50. to these two questions in order. The result will be:

```
PRICE 55.55
SALE 50.
DISC% 9.9909991%
```

You had to use the ENTER key between results if you were outputting to the display. We also note the percent of the discount calculated from the above is not exactly 10%. This is as expected. If we are working with even pennies it is not possible to always produce even results.

To be complete, we recycled once more requesting the SALEs price as our output. The following results were obtained:

```
PRICE 55.55
SALE 49.995
DISC% 10.%
```

This completes the three alternatives in the DISC% menu. The results when solving for any unknown was the same except for a slight round off error as noted.

```
RUN "GPM"
```

Operation of all the routines are similar. The menu for this routine is:

```
GPM COST PRICE?
```

Operation of this menu consists of selecting the alternate you wish to solve for, and then input in the other two factors. In turn we have listed the item to be solved for and the output we obtained:

```
Solving for GPM

PRICE 55.55
COST 50.
GPM 9.990991%

Solving for COST

PRICE 55.55
COST 49.995
GPM 10.%

Solving for PRICE

PRICE 55.555555556
COST 50.
GPM 10.%
```

The numbers we selected were similar to the DISCount run to illustrate how similar these two approaches were.

```
RUN "MARKUP"
```

The menu for this routine consists of the following:

```
COST MU% PRICE?
```

In turn the output for the unknown selected with its input reproduced, follows:

```
Solving for COST

PRICE 50.
COST 45.45454545
MARKUP 10.%

Solving for MARKUP

PRICE 50.
COST 45.45
MARKUP 10.0110011%

Solving for PRICE

PRICE 49.995
COST 45.45
MARKUP 10.%
```

The problem of round off again appears in our calculations. As we can see for all practical purposes the problem is minor.

```
RUN "TAX"
```

The tax routine is different from our other routines. Here there are four factors of interest, rather than three, however, only two factors are needed to produce all four of the factors. We had to select which items of input to use in each part of our routine.

The menu for this routine is:

```
TAX TAX% GROSS PRICE?
```

We will now identify the output of each, in turn, and specify the items we selected to input.

```
Solving for TAX with inputs of TAX% and PRICE

PRICE 50.
TAX 3.
GROSS 53.
TAX% 6.%

Solving for TAX% with inputs of GROSS and PRICE

PRICE 50.
TAX 3.
GROSS 53.
TAX% 6.%

Solving for GROSS with inputs of TAX% and PRICE

PRICE 50.
TAX 3.
GROSS 53.
TAX% 6.%

Solving for PRICE with inputs of GROSS and TAX%

PRICE 50.
TAX 3.
GROSS 53.
TAX% 6.%
```

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EXAMINATION OF PROGRAM

The program has been structured by the use of statement numbers. Statement number 1 is the main menu. This line has the name "RETAIL" in front of it. This is the method used to find the line when you type RUN "RETAIL". The GOTO statement at the end of this line sends the flow of the program to a line with a name marker.

The "MARKUP" routine is found in lines 11 through 14. The first line of the routine is the main menu and is identified with the word "MARKUP". Again this is the method used to find the line from the main menu or when you type RUN "MARKUP". Lines 12 and 13 are used to perform the calculations needed to produce the specified results. The last line in this set prints the results and then returns the flow of the program to the main menu. If you wish to have the program recycle change the GOTO "RETAIL" at the end of line 14 to GOTO "MARKUP".

Lines 20 through 24 are for the "GPM" gross profit margin routine and are organized in a manner similar to lines 11 through 14. The first line is the working menu, the middle lines do the calculations, and the last line prints the results. Again if you change the GOTO "RETAIL" in line 24 to GOTO "GPM" you can force the program to recycle to the working menu only.

The "TAX" routine is found in lines 30 through 35. They are organized in exactly the same manner as the remainder of the program.

The last routine, "DISC", is found in line 40 through line 44. Again this routine is organized in a like manner to the preceeding routines. The last two routines can be made to cycle to themselves in the same manner as the first two routines.

PROGRAMMING THE POCKET COMPUTER

We have used some features of the pocket computer that are different from other computers we know of. For example, the THEN may not be used with the IF statement except in place of the GOTO statement. We tried using extra THEN statements and obtained an error.

The identification of a line with a name such as "RETAIL" only works in the pocket computer. In addition the statement .10M in your pocket computer is almost the same as .01 * M. Both are multiplication instructions, the difference seems to be in the hierarchy of operations. The .01M has a higher hierarchy than .01 * M.

The GOTO A$ in line 1 and the GOTO "RETAIL" in lines 14, 24, 35, and 44 are also unusual statements and we believe unique to the pocket computer. The GOTO A$ directs the flow of the program to a line with a name that matches the string variable A$. The GOTO "RETAIL" directs the program to a line with the name "RETAIL", such as line 1.

SUMMARY

This collection of programs may be used by the retail merchant at the point of sale. They can calculate many of the different factors which concerns the retailer, discounting information, gross profit margin, markup, and tax information. The routines are easy to input into thecomputer and can be stored for instantaneous use in the pocket computer's low power memory.

This is just one example of what may be done with the pocket computer. We have two books being published shortly by WM. C. BROWN Publishing Company addressing the use of the pocket computer. One book is instructional while the second book is a collection of programs in various fields.

LISTING

The following listing has some extra space left between the individual routines. The lines have been left to make it easier for you to understand the program, do not try to input blank lines into your pocket computer. We know of no way to do this.

Other than the addition of these blank lines we have copied the list exactly as it will appear in your pocket computer.

```
1:"RETAIL" INPUT "DISC GPM MARKUP TAX?";A$:GOTO A$

10:"MARKUP"INPUT "COST MU% PRICE?";A$
11:IF A$="MU%"INPUT "PRICE COST?";S:INPUT C:M=(S/C-1)*100
12:IF A$="COST"INPUT "PRICE MARKUP?";S:INPUT M:C=S/(.01M+1)
13:IF A$="PRICE"INPUT "COST MARKUP?";C:INPUT M:S=C*(.01M+1)
14:PRINT "PRICE ";S:PRINT "COST ";C:PRINT "MARKUP ";M;"%":
   GOTO "RETAIL"

20:"GPM"INPUT "GPM COST PRICE?";A$
21:IF A$="GPM"INPUT "PRICE COST?";S:INPUT C:G=(S-C)/S*100
22:IF A$="COST"INPUT "PRICE GPM?";S:INPUT G:C=S-.01GS
23:IF A$="PRICE"INPUT "COST GPM?";C:INPUT G:S=C/(1-.01G)
24:PRINT "PRICE ";S:PRINT "COST ";C:PRINT "GPM ";G;"%":
   GOTO "RETAIL"

30:"TAX"INPUT "TAX TAX% GROSS PRICE?";A$
31:IF A$="TAX"INPUT "TAX% PRICE?";U:INPUT P:T=.01UP:G=P+T
32:IF A$="TAX%"INPUT "GROSS PRICE?";G:INPUT P:U=(G-P)/P*100:
   T=.01UP
33:IF A$="PRICE"INPUT "GROSS TAX%?";G:INPUT U:P=G/(1+.01U):
   T=.01UP
34:IF A$="GRROSS"INPUT "TAX% PRICE?";U:INPUT P:G=P+.01UP:
   T=.01UP
35:PRINT "PRICE ";P:PRINT "TAX ";T:PRINT "GROSS ";G:PRINT
   "TAX% ";U;"%":GOTO "RETAIL"

40:"DISC"INPUT "PRICE DISC% SALE?";A$
41:IF A$="PRICE"INPUT "DISC% SALE?";D:INPUT S:P=S/(1-.01D)
42:IF A$="DISC%"INPUT "PRICE SALE?";P:INPUT S:D=(P-S)/P*100
43:IF A$="SALE"INPUT "PRICE DISC%?";P:INPUT D:S=P-.01DP
44:PRINT "PRICE ";P:PRINT "SALE ";S:PRINT "DISC% ";D;"%":
   GOTO "RETAIL"
```

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ASSEMBLY LANGUAGE FOR BEGINNERS (PART 6)

Joseph Rosenman

"Central Processing Unit." The place where the computer "processes" information. If we were to open up our TRS-80, we would see a big chip marked (what else) Z80. In our computers, this is the CPU. How does it work? Just as we write machine language instructions to tell the CPU what to do, it (the CPU) contains special instructions that tell it *how* to execute the instruction. We have described machine language as the most primitive level of programming a microcomputer. While this is true, many things must happen inside the CPU during the execution of the instruction. When the machine instruction enters the CPU, the code "triggers" special "micro-code". This code tells the CPU how to execute the instruction.

I have already mentioned the various registers in the Z80 microprocessor. All CPU's have a "brain in a brain," that tell it "how to do it." This is usually known as the Control Unit. In addition to the Control Unit, Registers, and Microcode, there is the Arithmetic Logic Unit. The ALU is actually a special invisible register that is responsible for all data manipulation. Unfortunately, I have been unable to inspect a detailed diagram of the internal architecture of the Z80. It is possible that all of the Shifts, Rotates, Adds, Subs, Ors, Ands, Xors, Negs, and whatever else are performed directly in the ALU. Some CPUs will include a special Shift register, and other assorted devices to facilitate internal processing. I regret the fact that I'm not *sure*, but I believe the ALU in the Z80 "does it all."

What is the point of this discussion? Basically, it is intended to provide a "flavor" of what is going on inside the CPU. It is an interesting fact that, inside the CPU, there is a virtual computer within a computer. The microcode (which is a permanent resident program) is similar to your "user" program. (There"are even computers that allow the micro-code to be programmed. These systems are known as "micro-programmable" computers.) The registers in the CPU are similar to your programs DATA memory. The Control Unit is like the CPU. What does the Control Unit actually do? It changes the electrical signals travelling on the "BUS", thus causing events to take place. Some events include: Select a memory address, read or write the data in memory, send or read a value from an I/O port, etc. It may surprise you to know that the single machine language instruction might cause ten, twenty, even one hundred micro-code instructions to be executed. If the subject of micro-programming is of interest to you, I strongly recommend "An Introduction to Microcomputers, Volume 1," by Adam Osborne (Osborne & Associates. Inc., Berkeley, CA, 1976). This book includes a detailed discussion on "concepts of micro-programming." It is not easy going, so you might want to start with Volume 0 (there really *is* a Volume 0).

Now, back to programming! Here is the problem: Put the number 0 in address 7000, 1 in 7001, 2 in 7003, and a 3 in 7004. Here is memory before, the program, and memory after.

```
7000  35 44 23 87 45 11 00 E1 43 54 65 5F 45 25 15 87
7010  09 F4 3B AA 00 AC A2 55 3D 2C 44 32 FF FA 50 37


Label   Command Argument        Comment
        LD      HL,7000H        ;Start Address
        LD      A,0             ;Start value
        LD      (HL),A          ;Save a 0
        INC     HL              ;HL=HL+1
        INC     A               ;A=A+1
        LD      (HL),A          ;Save a 1
        INC     HL
        INC     A
        LD      (HL)
        INC     HL
        INC     A
        LD      (HL)

7000  00 01 02 03 45 11 00 E1 43 54 65 5F 45 25 15 87
7010  09 F4 3B AA 00 AC A2 55 3D 2C 44 32 FF FA 50 37
```

What do you suppose INC HL means? It means take whatever is in the HL register, and increment it (add one to it). Rather then reloading a new address into HL (and a new constant in A), we allow the program to do it for us. Notice that it is possible to use an INC with both 16 bit and 8 bit registers. In fact, it is possible to INC or DEC all of the standard registers (A, B, C, D, E, H, L, BC, DE, HL, IX, and IY). There *is* a difference between 8 bit and 16 bit INCs and DECs. Only the 8 bit INCs and DECs set the status flags. I trust that you have all realized that a DEC is a Decrement (subtract one).

Next on our agenda is the JP (Jump) instruction. A jump causes the program to go to some other location, and continue execution at that location. I know, it sounds terrible. In reality, this is very much like a GOTO statement in BASIC. Since I mentioned BASIC (did I mention BASIC???), let's recall the FOR/NEXT statement. This structure usually involves the INC or DEC of a value, and a GOTO. Consider:

```
FOR I=9 TO 0 STEP -1
  (whatever)
NEXT I
```

This will count down from 9 to 0, doing "whatever" each time, then jumping back to the DEC again. When is it time to stop jumping back to "whatever"? When the index (I) equals 0. This means that the zero value needs to be tested each "pass" through the "loop". Let's change the program slightly:

```
DIM ADDR(8) : ' ADDR is an integer array.
REM We "happen to know" that ADDR is at address
7000H.
```

```
J=0 : ' J is the index into the ADDR array.
FOR I=9 TO 0 STEP -1
    ADDR(J)=I
    J=J+1
NEXT I
```

Here is the next problem: Fill memory with sequence of numbers from 9 to 0, starting at 7000H. Now, let's write this program in assembly language.

```
7000  00 01 02 03 45 11 00 E1 43 54 65 5F 45 25 15 87
7010  09 F4 3B AA 00 AC A2 55 3D 2C 44 32 FF FA 50 37

Label   Command Argument       Comment
        LD      HL,7000H       ;Start Address
        LD      A,9            ;Start value
LOOP    LDPPP   (HL),A         ;Save value in memory
        INC     HL             ;Point to next address
        DEC     A              ;This is both a count & data
        JNZ     LOOP           ;If A isn't zero, repeat.
; All done!

7000  09 08 07 06 05 04 03 02 01 54 65 5F 45 25 15 87
7010  09 F4 3B AA 00 AC A2 55 3D 2C 44 32 FF FA 50 37
```

Now we're getting somewhere! What's new here is the JNZ and the Label: LOOP. JNZ stands for "Jump when not zero." Jump when WHAT is not zero? How does it know? Very simple, it looks at the status flags in the F register. There is a special flag known as the ZERO flag. If you look up the DEC A instruction in the Z80 reference table, you will see that this instruction sets the flags according to the result. This means that if the number in A is decremented to zero, the Z flag will be set. In every other case, the Z flag will be cleared. The argument of the JNZ instruction contains the place to "jump to." This field will always an address. Just one question, what address is LOOP???

In assembly language, we use something known as SYMBOLIC addresses. The way this works is we use a symbol to represent a specific value. In this case, the symbol LOOP is associated with the address of the: LD (HL),A instruction. How did LOOP come to represent the address of this instruction? This is so because the LOOP symbol appears in the LABEL field of the instruction. Whenever we need to jump to an address, define a table, or CALL a subroutine, we will use a label to indicate the "target" address. What are the advantages of using a symbol instead of an absolute address? First of all, readability. It is much easier to write, alter, or just understand a program where the "English-like" symbols are used. The second advantage is relocatability. The "Loop" program could be located at 7000H, 0C00H, even 4629H. It wouldn't matter where, since the jump is always to the target instruction, not to the absolute address.

When the program has been assembled, all of the symbols are converted into absolute addresses. Machine language has no symbols. In fact, for machine language to work, it must have no ambiguities. The assembler, on the other hand, is designed to aid the programmer. Symbols are the key. A symbol is constructed of upto 6 alphanumeric characters, and must begin with a letter. There are several symbols that are reserved. They are: A, B, D, E, E, H, L, I, R, IX, IY, SP, PC, AF, BC, DE, HL, C, NC, Z, NZ, M, P, PE, PO. These reserved symbols represent the registers, and the status flag codes. Whenever a symbol is being defined, it will appear in the LABEL field. Whenever a symbol is being accessed, it will appear in the ARGUMENT field. While several different things might appear in the ARGUMENT field (i.e., registers, constants, symbols, etc.), only symbols can appear in the LABEL field. One more fact about symbols: they can also be used just to make a program more readable. You don't have to access the symbol from another instruction.

Let's return to our program. The problem: alter the program so that the numbers are stored in ascending order, rather then descending order. There is a problem that will soon present itself. When does the program know that it is done? In the first version, the program completed when the A register equalled 0. Since it is starting at 1 and then incrementing, it won't reach 0 until it has counted all the way upto 256! Since we don't yet know another way to determine whether the program is completed, we have to "re-design" the program, so we can still use our test for zero.

```
7000  09 08 07 06 05 04 03 02 01 54 65 5F 45 25 15 87
7010  09 F4 3B AA 00 AC A2 55 3D 2C 44 32 FF FA 50 37

Label   Command Argument       Comment
        LD      HL,7008H       ;Start Address
        LD      A,9            ;Start value
LOOP    LD      (HL),A         ;Save value in memory
        DEC     HL             ;Point to next address
        DEC     A              ;This is both a count & data
        JNZ     LOOP           ;If A isn't zero, repeat.
; All done!
```

The changes are so simple you might not even notice them. First of all, the starting address was changed from 7000H to 7008H. Now the stasting address is the old ending address, and vice versa. The only other difference is that the INC HL was changed to a DEC HL.

Next month, we will discuss assembler directives and ASCII.

Joseph Rosenman
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continued from page 47

```
229 CLS : PRINT
230 PRINT "          LATEST STANDINGS "
231 PRINT "          ---------------- "
232 PRINT
233 PRINT "PLACE   TEAM   WON   LOST   PERCENT   G.B."
234 A$=   " ##      ##     ##    ##    .######    #.#"
235 FOR I=1 TO 10
240 PRINT USING A$; I;T(I,1);T(I,2);T(I,3);T(I,4);T(I,5)
245 NEXT I
249 GOTO 249
250 END
```

PROGRAM CONVERSION (PART VII)

Richard Kaplan

This month I will conclude my discussion of "obscure" and relatively unknown differences between the TRS-80 Models I, II and III. These include upper/lower case confusion (alert readers will note that I erroneously stated that I would cover this subject last month), error codes, and several additional operating system functions.

UPPER/LOWER CASE MODIFICATION

Both the Model II and the Model III will support upper and lower case characters, but not the Model I, right? *Wrong!* Although it *is* true that an unmodified Model I cannot *display* lower case characters, this computer can internally *distinguish* between the two character sets. In other words, a character entered with the shift key depressed is considered to be completely distinct from the same character without the shift key (except that they both) look the same on the screen, of course). This "difficulty" can result in extreme confusion and frustration for a programmer, especially if a disk or RS-232 transfer procedure was implemented.

To give an example of a potentially troublesome situation, suppose one wishes to transfer the following Model III program to the Model I:

```
10 INPUT "WHAT IS THE THIRD LETTER OF THE WORD 'computer'";X$
20 IF X$="m" THEN PRINT "CORRECT!!": END
30 PRINT "WRONG, DUMMY!"
```

If this program were run on the Model III, the word 'computer' would be displayed in lower case, and the corresponding input would assumably be in lower case as well. If this program were transferred through an RS-232 interface, or if it were on a disk converted by most disk conversion routines to transfer from the Model III to the Model I, the lower case characters in lines 10 and 20 would be displayed as upper case, but they would really be in lower case. This might result in the following scenario when you RUN the program:

```
WHAT IS THE THIRD LETTER OF THE WORD 'COMPUTER'? M
WRONG, DUMMY!
```

If the preceding 'M' were entered, however, while simultaneously depressing the SHIFT key, the program would have accepted the user input.

To further clarify the use of the SHIFT key on the Model I, examine the following commands and their results:

```
PRINT ASC("A")
65
```

I'S, J'S AND THEIR RELATIONSHIP TO BASEBALL

continued from page 47

big improvement, by using the PRINT USING statement. You may want to "dress it up" even more, with borders, etc.

A few comments on how I set up the headings might be in order. I first did line 233, placing the headings where I wanted them. Then I did line 234, but notice that I've spaced the opening double-quote right under the opening double-quote from line 233. This allows me to very easily go across and line things up right under the headings. Next I did the table title, line 230, centering it between the opening and closing double-quotes in line 233. Then it was easy to add the other PRINT statements for line skips, and then the loop and the PRINT USING. Note, too, that I went ahead and listed the "place" each team is in, by simply printing "I", in the loop. Of course there is a little problem if there is a tie, and you might want to modify your program to take care of this situation. An easy way around this might be to print an asterisk somewhere on the lines of the two or more teams that are tied.

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```
PRINT ASC("A") (this time with SHIFT held down)
97
```

Evidently the SHIFT key has altered the ASCII value of the character depressed, even though its appearance has remained unchanged.

The bottom line is that you must be extremely cautious in transferring programs that contain lower case characters, especially those that involve string comparisons. Some disk conversion utilities automatically change lower case to upper case, but this can be a disadvantage if one wishes to later convert the program to the Model III and still retain some of the lower case (such as in user prompts). In any case, if one ever encounters an instance in which a string comparison does not appear to be functioning correctly, the best advice is simply to retype the entire line. You may be pleasantly surprised!

IF — THEN

A quite trivial and totally unnecessary incompatibility in Model II BASIC is the requirement that a THEN statement be included in every IF—THEN clause that contains anything more than a GOTO statement. For example, the following program:

```
10 IF A=0 PRINT "A EQUALS 0"
```

will function correctly on both the Model I and the Model III, but on the Model II it will cause a syntax error. An equivalent conversion would be the following:

```
10 IF A=0 THEN PRINT "A EQUALS 0"
```

The best approach to take when developing software that you wish to convert for the Model II is to include the THEN statement in every IF — THEN clause. This may seem to be completely unnecessary (after all, if the Model III's interpreter can understand the command, someone should be able to develop the same capability for the Model II), but of all compatibility problems among TRS-80s, this one is probably the easiest to work around.

SHIFT @ VS. HOLD

Quite often when running a BASIC program you may wish to momentarily halt the screen display. This can be achieved easily on any of the three TRS-80s.

On the Model I or Model III, pressing the SHIFT and @ keys simultaneously will halt the screen. Pressing any key will cause the computer to resume normal operation. On the Model II, the HOLD key is specifically designed for this purpose. Pressing HOLD will halt the program, any pressing any key will cause the program to resume.

The SHIFT @ vs. HOLD "incompatibility" does not pose a problem for programming so much as for documentation. Instructions for programs that run on all TRS-80s should include an explanation of this difference.

ABBREVIATED COMMANDS

The Model III recognizes many abbreviations of BASIC commands which are only supported by Model I when using operating systems other than TRSDOS, and are not available at all on the Model II.

The three keys SHIFT ↓ Z, all pressed simultaneously, will display the last line of a Model III BASIC program. As with the other functions to be mentioned, many alternative Model I operating systems (such as DOSPLUS) also support this abbreviation.

SHIFT ↑ is a Model III abbreviation that will list the first existing line in a program in memory. ↓ will list the line following a line currently displayed, ↑ will show the line immediately before a line currently displayed.

Typing a period on the Model III will display the last line edited or listed, while on the Models I and II you must type LIST, then period.

The comma is a Model III abbreviation which will allow you to edit the last line edited or listed. The equivalent Model I or II command would be EDIT, then period.

Finally, E and L are Model III abbreviations for EDIT and LIST. These abbreviations must be followed by a line number (for instance, E60 or L100).

The preceding explanations of Model III abbreviations were offered not as a guide in program conversion, per se, but in order to provide new users of the Model III a look at some of the new functions available on this computer.

SYSTEM "SCREEN" VS. SHIFT ↓ *

On the Model II (with TRSDOS 2.0) the command SYSTEM "SCREEN" will route an exact replica of the screen to a line printer. On the Model III (or the Model I with an alternative operating system such as DOSPLUS) the command SHIFT ↓ * will perform the same function.

One disadvantage of the Model III screen dump facility is that it cannot be used from within a BASIC program. It can be used during the execution of a program by pressing the appropriate keys, but it cannot be made part of the actual program. This can be overcome by writing a screen-dump routine which PEEKs into memory and PRINTs out the appropriate characters, or by giving the operator on- screen instructions to press SHIFT ↓ *.

On the other hand, a disadvantage of the Model II screen-dump facility is that while it **can** be part of a BASIC program, it cannot be used during the execution of a program unless the SYSTEM "SCREEN" command is actually a statement in the program. The only other way to use this function during execution of a BASIC program would be to BREAK the program and give the SYSTEM "SCREEN" command, then type CONT to resume program execution. However, this method would put the manual commands on the screen, and they would also be printed out.

VARIABLE REFERENCING

Under Model III TRSDOS, he command CMD"X","ZZZ" will search an entire BASIC program and produce a listing of all line numbers in the program where ZZZ appears. This feature can be very useful in debugging or editing programs.

The Model I can produce a variable or text reference only under control of an alternative operating system. Under DOSPLUS, for example, the command CMD"REF",S=INPUT will list all lines with the keyword INPUT. CMD"SR","INPUT" would peform the same func-

tion, but the actual text of the lines would also be displayed.

The Model II cannot display a reference of variables, text, or keywords, except by running a utility program designed to peform this function.

As I mentioned with the abbreviations, this information is provided not because it is directly pertinent to program conversion, but because it is useful to anyone developing software on the Model III.

ERROR CODES

An error code is a numerical value generated any time an error is detected by a computer. On all three TRS-80s, this value may be determined by accessing the value of ERR. The ERR value corresponds to a value listed in your computer manual, where you will find a detailed explanation of the specific error.

On the Models I and III, ERR does not generate the same value as the one listed in the computer's manual. The expression ERR/2 + 1 must be used in order to get the proper code. On the Model II, the ERR value is correct as is.

Frequently ERR is used within an error-handling routine to display a message associated with a specific error condition. For example,

```
60000 IF ERR=106 THEN PRINT "FILE DOES NOT EXIST"
60010 IF ERR/2 + 1 = 2 THEN PRINT "SYNTAX ERROR"
```

The foregoing routine would check to see if a "FILE NOT FOUND" error occurred on the Model I or III, and, if so, it would print an appropriate message. If not, it would proceed to check for a syntax error. (Note that ERR, *not* ERR/2 + 1, is used on the Models I and III for error codes greater than 100, which are TRSDOS errors. This is not documented very clearly in the Model I or Model III manuals.)

Error codes on the Model II are somewhat different than those on the other two models. Consult the chart below for a detailed comparison of error codes. To give an example of an equivalent error-handling routine for the Model II for a "FILE NOT FOUND" error and a syntax error:

```
60000 IF ERR=53 THEN PRINT "FILE DOES NOT EXIST"
60010 IF ERR=2 THEN PRINT "SYNTAX ERROR"
```

Note the use of 53, not 106, to denote a non-existent file. Also note that although all models use 2 to denote a syntax error, the Models I and III use the expression ERR/2 + 1, whereas the Model II simply uses ERR.

ERROR CODE CONVERSION CHART

This chart lists equivalent error codes, where applicable, for the Models I, II, and III. A blank space in the chart denotes and error which is not applicable to a particular computer.

Note that the Models I and III use the expression ERR/2 + 1 to calculate the true error code for BASIC errors, while the Model II simply uses ERR. Errors which are not listed on the chart may generally be assumed to be equiva-

continued on page 60

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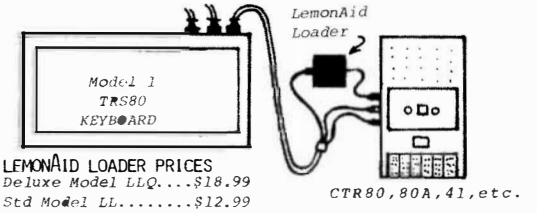

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THE VERSATILE PEEKER

Friedhelm Hoehne

This small program was written primarily for the beginner, who can use it as a practical tool to understand how memory addressing is arranged in the TRS-80.

The program displays any memory location from 0 to 65535 in decimal, hexadecimal, and printable character notation. It translates and converts your decimal input address, displays the decimal real address, and the hexadecimal and decimal virtual address. Since hexadecimal conversion is very slow in Basic, a hex on/off switch is provided for convenience.

There are five function keys used by the program, as follows:

↑ Page backward (up arrow)
↓ Page forward (down arrow)
Q Quit, enter new address or end program
H Hex on/off. Hex conversion toggle switch
S Scan, display continuously pre-selected function (e.g., page backward and hex = on). Press any key to stop the scan

```
1   'COPYRIGHT (C) 1981 BY
10  'FRIEDHELM HOEHNE
20  '6429 DIXON DRIVE
30  'RALEIGH NC 27609
40  'PHONE 919-782-6016
100 '****************************************
110 '*  "PEEK/BAS"  A VERSATILE PEEK PGM  *
120 '*  ---------- MOD.I/III ----------  *
130 '*         CREATED 81-04-20          *
140 '*         UPDATED 81-05-12          *
150 '****************************************
200 CLS : CLEAR 500 : DEFINT A-Z : DEFSNG D,M
210 F1$="######":F2$="###":HEX$="OFF":SCAN$="OFF"
220 L=64:L1$=STRING$(L-1,61):L2$="="+CHR$(192+L-3)+"="
230 L3$=STRING$(L,32)
240 HL$="          T H E   V E R S A T I L E   P E E K E R"
250 H1$="VIRTUAL ADDRESS     REAL ADDRESS
      - - -  CONTENTS  - - -
260 H2$="  HEX     DEC            DEC
        HEX    DEC    CHR
270 H3$=(STRING$(L,61)):T1$=(STRING$(L,45))
280 T2$="<"+CHR$(91)+">  PAGE BW
<Q>  QUIT             <H> TOGGLE SWITCH"
290 T3$="<"+CHR$(92)+">  PAGE FW
<S>  SCAN =                  HEX = "
300 CLS : PRINT HL$
310 PRINT @ 266,"<ENTER> TO CONTINUE OR <T> FOR TUTORIAL"
320 GOSUB 1230 : IF KB$<>CHR$(13) AND KB$<>"T" THEN 320
330 IF KB$=CHR$(13) THEN 630
340 CLS : PRINT HL$ : PRINT : PRINT L1$
350 PRINT"=  THIS PROGRAM DISPLAYS ANY MEMORY LOCATION
FROM 0 TO 65535  ="
360 PRINT"=  IN DECIMAL, HEX AND PRINTABLE CHARACTER
NOTATION.          ="
370 PRINT L2$
380 PRINT"=  IT TRANSLATES AND CONVERTS YOUR DECIMAL
INPUT ADDRESS,     ="
390 PRINT"=  DISPLAYS THE DECIMAL REAL ADDRESS, AND
THE HEX AND        ="
400 PRINT"=  DECIMAL VIRTUAL ADDRESS.
                   ="
410 PRINT L2$
420 PRINT"=  AS HEX CONVERSION IS VERY SLOW IN BASIC,
A HEX ON/OFF       ="
430 PRINT"=  TOGGLE SWITCH IS PROVIDED FOR YOUR
CONVENIENCE.           ="
440 PRINT L1$: GOSUB 1280
450 CLS : PRINT L1$,L2$
460 PRINT"=                    PROGRAM FUNCTION KEYS:
                   ="
470 PRINT"=                    ---------------------
                   ="
480 PRINT"=  <^> = PAGE BACKWARD, ↑
                   ="
490 PRINT"=  <";CHR$(92);"> = PAGE FORWARD, (DOWN ARROW)
                     ="
500 PRINT"=  <Q> = QUIT, ENTER NEW ADDRESS OR END PROGRAM
                  ="
510 PRINT"=  <H> = HEX ON/OFF, HEX CONVERSION TOGGLE SWITCH
                 ="
520 PRINT"=  <S> = SCAN, DISPLAY CONTINUOUSLY PRE-SELECTED
FUNCTION      ="
530 PRINT"=              E.G. PAGE BACKWARD AND HEX = ON
                 ="
540 PRINT"=              PRESS ANY KEY TO STOP  - SCAN -
                  ="
550 PRINT L2$,L1$
600 '=========================
610 '=   INPUT/PROCESS RTN   =
620 '=========================
630 PRINT @ 896,"     ENTER PEEK START ADDRESS"; STRING$(35,32);
640 INPUT"FROM  0 TO 65535  OR  <E> FOR END    ";M$: MV=VAL(M$)
650 IF M$="E" THEN END
660 IF M$ < CHR$(48) OR M$ > CHR$(57) OR MV < 0 OR MV > 65535
THEN CLS : GOTO630
670 MR=MV-1:PG=0
680 CLS : PRINT H1$,H2$,H3$           'DISPLAY HEADER
690 PRINT @ 832,T1$;:PRINT T2$,T3$;HEX$; 'DISPLAY PF KEYS
700 IF PG=2 THEN 630                  'NEW INPUT OR QUIT
710 P=193:IF PG=1 THEN MR=MR-20       'DECREMENT IF PAGE BW
720 FOR J=1 TO 10         'CLEAR
730 PRINT @ P,L3$;: P=P+64 ' DISPLAY
740 NEXT J: P=193          ' WINDOW
750 FOR J=1 TO 10
760  MR=MR+1  'INCREMENT REAL ADDRESS
770  IF MR > 32767 THEN MR=(-1*(65536-MR)) 'ADDRESS
780  IF MR < -32768 THEN MR=65536+MR       ' TRANSLATION
790  IF MR=>0 AND MR=< 32767 THEN MV=MR ELSE MV=65536+MR
800  CD=PEEK(MR): IF HEX$="OFF" THEN CH$=" ": MH$=" ":
GOTO 830
810  DEC=MV:GOSUB 1310 :MH$=H$ 'CONVERT
820  DEC=CD:GOSUB 1310 :CH$=H$ ' TO HEX
```

continued on page 60

™TRS80 color

From the January 1981 issue of the CSRA Computer Club newsletter:

> There was some amusement at the November meeting when the Radio Shack representatives stated that the software in the ROM cartridges could not be copied. This month's 68 Micro Journal reported they had disassembled the programs on ROM by covering some of the connector pins with tape. They promise details next month. Never tell a hobbyist something can't be done! This magazine seems to be the only source so far of technical informations on the TRS-80 color computer™. Devoted to SS-50 6800 and 6809 machines up to now, 68 Micro Journal plans to include the TRS-80 6809 unit in future issues.

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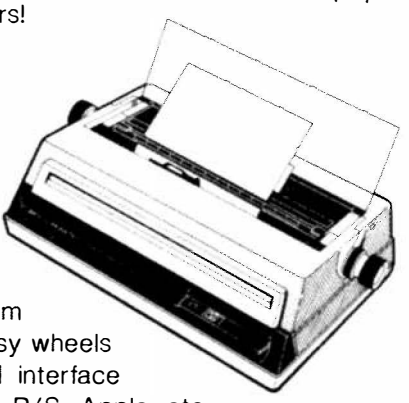

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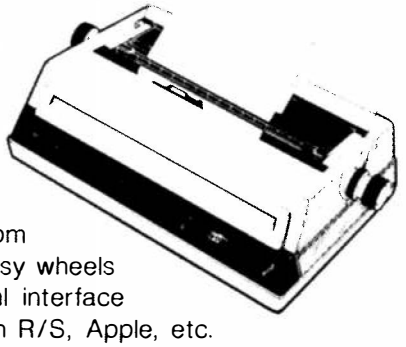

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THE VERSATILE PEEKER

continued from page 58

```
830  IF CD < 32 OR CD > 127 THEN CC=32 ELSE CC=CD 'SELECT
PRTBLE CHRS
840  PRINT @ P,MH$;: PRINT TAB(8) USING F1$;MV;          'DISPLAY
850  PRINT TAB(23) USING F1$;MR;: PRINT TAB(42) CH$;      ' ADDRS
860  PRINT TAB(49) USING F2$;CD;: PRINT TAB(57) CHR$(CC);' AND
870  P=P+64                                              'CONTENTS
880 NEXT J
890 IF SCAN$="ON " AND INKEY$="" THEN 710
900 SCAN$="OFF": PRINT @ 996,SCAN$;: GOSUB 1030
910 IF SCAN$="ON " THEN 710   ELSE 700
1000 '============================
1010 '=   PAGING/SWITCHING SBR   =
1020 '============================
1030 GOSUB 1230
1040 IF KB$<>CHR$(10) AND KB$<>CHR$(91) AND KB$<>"Q" AND
KB$<>"H" AND KB$<>"S" THEN 1030
1050 IF KB$="H" THEN 1100
1060 IF KB$="S" THEN 1120
1070 IF KB$=CHR$(10) THEN PG=0:RETURN    'PAGE FW
1080 IF KB$=CHR$(91) THEN PG=1 ELSE PG=2 'PAGE BW ELSE QUIT
1090 RETURN
1100 IF HEX$="ON "THEN HEX$="OFF" ELSE HEX$="ON " 'HEX TOGGLE
1110 PRINT @ 1018,HEX$;: GOTO 1030                  ' SWITCH
1120 SCAN$="ON ": PRINT @ 996,SCAN$;:
RETURN         'SCAN SWITCH
1200 '=================
1210 '=  INKEY$ SBR   =
1220 '=================
1230 KB$="": KB$=INKEY$: IF KB$="" THEN 1230
1240 KB =VAL(KB$): RETURN
1250 '=================
1260 '=   PAUSE SBR   =
1270 '==========-======
1280 PRINT:PRINT"<ENTER> TO CONTINUE"
1290 GOSUB 1230 :RETURN
1300 '=====================-=====
1310 '=  HEX CONVERTION SBR   =
1320 '=======================-=
1330 HX$="0123456789ABCDEF":H$=" "
1340 IF DEC=0 THEN H$=" 0": RETURN
1350 PWR=LOG(DEC)/LOG(16)
1360 FOR I=PWR TO 0 STEP -1
1370  DIV=INT(16↑I+.5)
1380  CH=DEC/DIV
1390  H$=H$+MID$(HX$,CH+1,1)
1400  DEC=INT(DEC-CH * DIV+.5)
1410 NEXT I: RETURN
```

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Raleigh, NC 27609 ■

PROGRAM CONVERSION

continued from page 57

lent among all three models, bearing in mind the qualification mentioned in the preceding sentence.

The DISK BASIC error codes listed in this chart reflect the codes printed in Radio Shack's preliminary TRSDOS manual. I have used these codes in my program development, and I find them to be accurate on the Model III I use, except that *ERR*/2+1 should *not* be used for these (DISK BASIC) codes. Simply ERR will generate the proper code.

About two weeks ago Computronics took delivery of a new Model III, and I noticed in its manual (the final version) that the Model III DISK BASIC error codes listed are the same as those for the Model I. I do know that Tandy has been supplying recent Model III's with a new ROM, but I do not know if this change in error codes is a result of a ROM difference or a difference in TRSDOS 1.3 operating systems.

As of our press deadline, I was unable to investigate further the complete background regarding the Model III DISK BASIC error messages. I will provide more information as I obtain it. In the meantime, I would advise Model III owners to test their error codes to see which ROM(?) and/or operating system(?) they have. If any reader has additional information regarding this situation, I would appreciate his sharing it with me.

ERROR	I	II	III
BASIC errors--Mod I & III owners use ERR/2+1			
Undefined User Function		18	
Resume w/o Error	19	20	19
Undefined/Unprintable Error	20	21	20
Missing Operand	21	22	21
Buffer Overflow/Bad File Data	22	23	22
L3 ("Disk BASIC Only%)	23		23
DISK BASIC errors-- (Mod III owners check ROM!)			
Field Overflow	51	50	100
Internal Error	52	51	102
Bad File Number	53	52	104
File Not Found	54	53	106
Bad File Mode	55	54	108
File Already Open	56	55	110
I/O Error	58	56	114
Disk Full	62	59	122
End of File/Input Past End	63	60	124
Bad Record Number	64	61	126
Bad Filename	65		128
Direct Statement in File	67	65	132
Too Many Files	68		134
Disk Write Protected	69		136
File Access Denied	70		138

This concludes this month's tips on program conversion. As always, I am open to reader input. If you have successfully used a technique I described, if you have a specific topic you would like to see covered, or if you have a specific program you have difficulty with, please feel free to write to me.

Richard Kaplan
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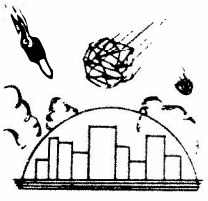

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- Shift and shift lock for upper case
- Search, Replace, and Automatic Search & Replace
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- Odd and even page user-definable headers, footers, and page number lines
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- Full screen editing of EDTASM* and BASIC text files
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- Print previewing formats text, inserts headers, numbers pages, etc. on the screen without printing it on paper.
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Note: Some features will only work if your printer has the mechanical capability.

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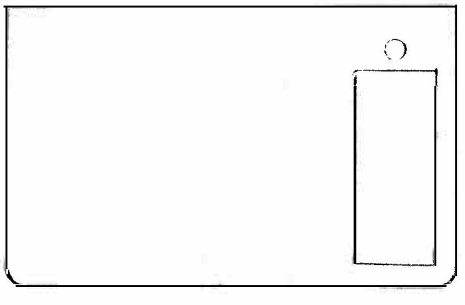

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Accounts Receivable

The objective of a computerized A/R system is to prepare accurate and timely monthly statements to credit customers. Management can generate information required to control the amount of credit extended and the collection of money owed in order to maximize profitable credit sales while minimizing losses from bad debts. This system is invoice-oriented. Invoices can be entered before they're ready for billing, after billing, or even after they are paid. Accounts Receivable allows entry of new invoices, credit memos, debit memos, or modification or deletion invoice and allows for progress payment. The transaction information includes: type of A/R transaction, P.O. #, description of P.O., billing date, general ledger sales account #, invoice amount, shipping and transportation charges, tax charges, payment, and progress payment information. Reports include: summary or detail listing of invoices not yet billed, open items (unpaid invoices), closed items (paid invoices), and aging. Statements may be printed at any time and follow the format of nationally available forms.

Order Entry

The Order Entry Module was designed as a supplement to the Accounts Receivable Module, and will not operate independently. This system allows you to add, change, delete, list and print invoices; apply an invoice to correct customer account; generate computer assigned invoice numbers; note type (invoice credit memo, debit memo); record customer order number, invoice date, shipping date, FOB location, method of shipping, salesman, and payment terms; print selected number of shipping labels; enter, display and correct 10 lines of data per invoice, noting the part number, description, price, quantity ordered, extension, taxable or not. It also allows the user to enter, display and correct invoice totals, noting the invoice subtotal, taxes, shipping and handling, with disbursement up to 5 General Ledger accounts; print a transaction report; maintain a terms code file in the system; update Account Receivable and generate summary report totals. It automatically coordinates to the Inventory Module (if used) to determine description, price and out of stock status, and to immediately deplete inventory stock. Price fields are easily modified to include percent or dollar discount.

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The Accounts Payable system receives data concerning purchases from suppliers and produces checks in payment of outstanding invoices. Several reports are available to supply information needed for the analysis of payments, expenses, purchases and cash requirements. The Accounts Payable system is invoice-oriented. It handles new invoices, credit memos and even debit memos and allows modification and deletion of invoices. The flexible check calculation procedures allows checks to be calculated for a set of vendors, specific vendors or even specific invoices. The reports include open item listings and closed item listings (both detail and summary), debit and credit memo listings, aging, check register report (to give an audit trail of checks printed), and vendor listing and vendor activity. Update reports are useful for audit trails and checking for accuracy. Checks may be printed at any time and follow the format of nationally available forms.

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Model I or III **$50.00**

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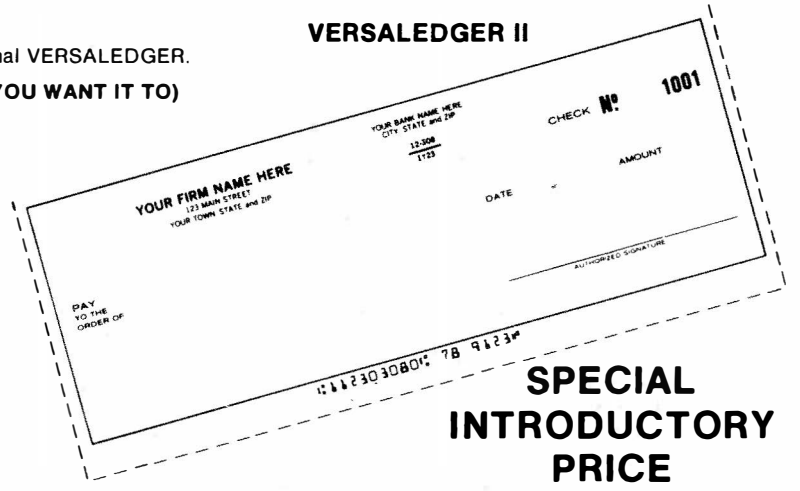

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PRINTING				
Print continuous-form checks?	No	Yes	Yes	Yes
Print single checks?	No	Yes	Yes	Yes
Check alignment test?	No	Yes	Yes	No
Print check stubs?	No	No	Yes	Yes with limited information
Print check register statement?	Yes	Yes	Yes	Yes
Print bank statement reconciliation?	Yes	Yes	Yes	Yes
Print income and expense subtotals?	Expense only	No	Yes	No
Print individual account statements?	Yes	No	Yes	Yes
Print check register notes?	No	No	Yes	No
Print account distribution statement?	No	No	Yes	No
Payee Address file (for automatic printing of address on checks)?	No	Yes	Yes	No
Number of payees	N/A	75	40 Mod I 75 Mod III	N/A
Number of lines in payee address	N/A	3	4	N/A
TRANSACTION ENTRY				
Check "In Pay of" file (for automatic printing of what check is for on checks)?	No	Payee only	Yes	No
Number of payees/payors in file	N/A	75	40 Mod I 75 Mod III	N/A
Distribute transactions over multiple accounts	Difficult	Difficult	Easy	Easy
Flag tax-deductible items in any account?	Yes	No	Yes	Yes
User-friendliness	Good	Excellent	Excellent	Fair
Protection against user error	Good	Excellent	Excellent	Fair
Allow entry of manually-written checks?	Yes	Yes	Yes	Yes
Ease of finding checkbook balance	Easy	Difficult	Easy	Easy
MISCELLANEOUS				
Supplied with DOS?	No	TRSDOS	TDOS	Mod I TDOS Mod III No
System	Mod I and Mod III	Mod III only	Mod I and Mod III	Separate Mod I or Mod III
Accept lower-case commands?	No	No	Yes	No
Accept lower-case text?	No	Yes	Yes	Yes
Self-prompting?	Yes	Mostly	Yes	Mostly
Swapping of program diskettes required?	Yes	No	Mod I Yes Mod III No	No
VISICALC(tm)-compatible data?	No	No	Yes	No
Documentation quality	Fair	Excellent	Excellent	Fair
CAPACITIES				
Maximum amount per transaction	99999.99	99999.99	99999.99	Not listed in manufacturer's documentation
Maximum balance	99999.99	99999.99	99999.99	Not listed in manufacturer's documentation
Limit on deposits per day?	No	Yes — 1	No	No
Number of income accounts	1	1	Up to 223 total income and expense	Not listed in manufacturer's documentation
Number of expense accounts	Up to 99	Up to 30	Up to 223 total income and expense	Not listed in manufacturer's documentation
Limits on transactions	Mod I 100/mo Mod III 250/mo	2500/yr	Unlimited	Mod I 300/mo Mod III 2400/mo
Number of bank accounts	Unlimited - no interaction	9 - with interaction	Unlimited - no interaction	Unlimited - no interaction

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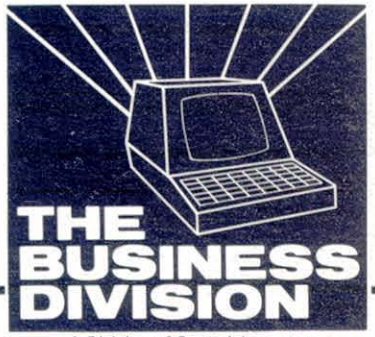

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