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**THE ORIGINAL MAGAZINE FOR
TRS-80™* OWNERS**

H & E COMPUTRONICS INC.

*TRS-80™ IS A TRADEMARK OF TANDY CORPORATION



8 USEFUL PRODUCTS

NEW PRODUCT
Photograph not available
at time of printing.

1 PRINTSWITCH

- Printer selector switch module allows two printers to be connected to a single TRS-80 system. Printer to be used is selected by switch.
- THE PROBLEM** of plugging and unplugging printer cables in order to select one printer or the other is eliminated by PRINTSWITCH.
- Small, unobtrusive design keeps your system *uncluttered*. Conveniently located switch allows instant access to either of your printers.
- Will work with any two similar or dissimilar parallel printers or printing systems including: dot matrix, daisy wheel, plotters, TRS-80 converted selectrics, etc.
- BUSINESS SYSTEMS** benefit from the ability to readily select one of two printers. For example a high speed dot matrix printer can be used for data, program listings and first drafts and a slower correspondence quality

printer utilized to generate letters, reports, etc.

- SIMPLE TO CONNECT.** Plugs directly into the parallel printer port of your TRS-80 and provides an edge connector for each of your two printer cables.
- PRINTSWITCH** comes completely assembled, tested, and ready to use with connector and instructions. *Printswitch A* is for model I and III, *PRINTSWITCH B* is for model II. Please specify when ordering. PRINTS—SWITCH A or B... **ONLY \$59.00**

2 PRINTER EXTENDER CABLE

- Adds 4 ft. to your existing printer cable. Our extension connects between your Expansion Interface and your present printer cable.
- High quality cable and gold plated contacts ensure reliable connection. **ONLY \$27.50**

3 TIMEDATE 80

- Complete, self contained "true" real time clock/calendar, TIME-DATE 80 continues to keep accurate time and date when the computer is turned off or experiences a power failure.
- SET IT ONCE**, and it's two replaceable "AAA" batteries (not included) keep TIMEDATE 80 running in excess of 3 years.
- The instant power is applied to the TRS-80, TIMEDATE 80 provides accurate MO/DATE/YR, DAY of WEEK, HR-MIN-SEC and AM/PM information.
- REPLACES** the computer's internal clock. If power fails and then restores, only TIMEDATE 80 will update the system with current TIME and DATE information, an impossibility with the computer's internal clock.
- QUARTZ CRYSTAL** based, TIMEDATE 80 is accurate to within a few seconds per month.

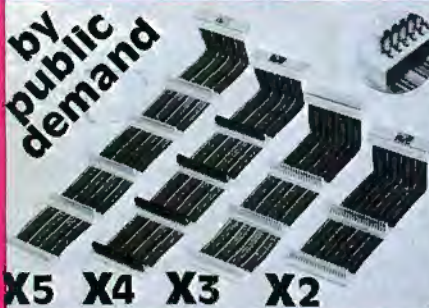
- PLUGS DIRECTLY** into the TRS-80 keyboard and gives the "TIMES" function even without an Expansion Interface. In disk systems, it plugs into the Expansion Interface. An optional "Y" connector provides for further expansion.
- TIMEDATE 80's small size keeps the computer table tidy. If you have an Expansion Interface, TIMEDATE 80 literally "DISAPPEARS" by slipping into the empty space in the bottom of the interface.
- Two sets of software, on cassette, come with TIMEDATE 80. "TIME-SET" is a step by step set of simple instructions for setting TIMEDATE 80. "TIMES" is a set of poke routines which patches any Disk Operating System to Level II TIMES to read TIMEDATE 80 and is easily incorporated into any user software. "TIMES" will always print the time and date when LISTING a program—great for keeping track of revisions!
- INVALUABLE** for providing accurate date and time information in business applications such as payrolls, receipts, etc.
- FULLY ASSEMBLED** and tested, 90 day warranty, complete with instructions and software on cassette. **\$95.00**, "Y" option, add **\$12.00**.



4 EXPANDABUS

- Connect all of your TRS-80 Model I devices simultaneously on the 40-pin TRS-80 expansion bus. End the hassle of plugging and unplugging your accessories.
- ANY DEVICE** that normally plugs into the Model I TRS-80 keyboard edge connector can be plugged into EXPANDABUS.
- For those with an Expansion Interface, EXPANDABUS plugs into the Expansion Port connector (located on the left side panel, to the right of the printer port) or between the keyboard and expansion interface.
- EXPANDABUS** is made of the highest quality materials. All gold plated contacts and high grade ribbon cable ensure the most reliable connection possible.
- Protective covers are provided for each connector (as shown on X4 in

- photograph) that can be removed and replaced as needed.
- FOUR STANDARD CONFIGURATIONS** will fill almost any requirement. We recommend that you order the next greater configuration above that which your application demands so that any future expansion will be provided for.
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- X2...\$29 X3...\$44 X4...\$59 X5...\$74**



5 THE ALPHA GREEN SCREEN

- IBM and all other mainframe houses use green screen monitors. The advantages of the green video screen are now widely known. Every TRS-80 user should enjoy the benefits that it provides.
- THE ALPHA GREEN SCREEN** is the only CURVED screen MOLDED exactly to the picture tube shape. It is cut precisely to cover the exposed area of the tube.
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- THE ALPHA GREEN SCREEN ONLY \$12.50** Please specify model



6 ANALOG-80:

8 DIGITAL MULTIMETERS PLUGGED INTO YOUR TRS-80!!! Measure Temperature, Voltage, Current, Light, Pressure, etc. Very easy to use. For example, let's read input channel #4 10 OUT 0.4. Selects input #4 and also starts the conversion 20 A = INP(0) Puts the result in variable A. Voila! Specifications: Input range: 0-5V to 0-500V. Each channel can be set to a different scale. Resolution: 20mV (on 5V range). Accuracy: 8 bits (5%). Port Address: jumper selectable. Plugs into keyboard bus or E/I (screen printer port). Assembled and tested. 90 day warranty. Complete with power supply, connector, manual. **\$139**

7 INTERFACER-80:

INTERFACER-80: the most powerful Sense/Control module.

- 8 industrial grade relays, single pole double throw isolated contacts. 2 Amp @ 125 Volts. TTL latched outputs are also accessible to drive external solid state relays.
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- Simple "INP" commands read the status of the 8 inputs.
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8 CHAIN BREAKER

LET THE "CHAIN BREAKER" FREE YOUR MINI-DRIVES. End the daisy-chain mess once and for all. Fits all mini-drives: Percom, Aerocomp, Shugart, Micropolis, MTI, Vista, Perlec, Siemens, BASF. Easy to install: just remove the drive cover, plug in the "CHAIN BREAKER" and replace the cover. Voila!!! Now you can change and move your drives around without disassembly. Keep the cover on and keep the dust out. High reliability gold plated contacts, computer grade 34 conductor cable. Tested and guaranteed. Get one for each drive. only **\$13.95**



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BITS AND PIECES

Howard Y. Gosman

Full Color

As you can see from the front cover, our magazine is now printed in full color. It is also continuing to grow, in order to bring you more of all the good things that you have come to expect from Computronics. We always enjoy hearing from readers, and we want to know your reactions to all the new features and departments we will be starting.

Expanded Color Computer Coverage

This month we begin the first of an expanded Color Computer Corner, which will be conducted by our newest Contributing Editor, Joseph Rosenman. Mr. Rosenman

has written many articles for us in the past, and will continue to do so in the future. He is an expert in many types of computing, and he has written articles about and programs for both the Models 1 and 3 TRS-80's in addition to the Color Computer. He will be glad to try to answer questions that you may have about the Color Computer. Just write "Color Computer Question" on the outside of the envelope, and enclose a self-addressed stamped envelope if you wish an individual reply.

New Beginner's Corner

This month we also have a new

continued on page 6

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

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

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COMPUTRONICS

THE CRYSTAL BALL

(NEW PRODUCTS OF INTEREST TO TRS-80™ OWNERS)

WARNING: The information found in our Crystal Ball Department cannot necessarily be verified. What follows are rumors, from what we consider to be reliable sources, concerning new products of interest to TRS-80 owners BEFORE this information is released to the general public.

1. As the Fall of 1981 begins, it is not difficult to see that big changes lie ahead in the personal computing field. On the one side, microcomputer manufacturers led by Tandy Corporation, Apple Computer and others are introducing larger systems, while on the other the giant corporations like IBM, Xerox, and Hewlett-Packard are introducing smaller systems. On the horizon and certain to become a significant factor in the United States market is the Japanese. Significant confrontations will occur as these corporations try to compete in the same marketplace. It's going to be interesting to watch.

While the chief beneficiaries of this competition will be the public and small businesses, the key to success is more likely to be product marketing and distribution rather than quality. Service and support will become as important as sales. IBM on the one hand, and Radio Shack on the other, are most likely to succeed, because their support is already in place while others are just getting started. IBM has always provided total support for its computers. Radio Shack has not only thousands of retail stores, but also many computer and service centers. In a couple of years, though, the picture may be completely different.

2. **Lifeboat Associates** is developing a board for the **TRS-80 Model III** that will make the **CP/M** disk operating system and several other features available. This board remaps the ROM dynamically and adds an additional 16K

RAM to give a total of **64K RAM**. A toggle switch will be included so that users can still run **TRSDOS**. The disk formatting will be different from **TRSDOS**, probably employing 20 to 24 sectors per track to give over 200K per drive. Double-sided drives will have a capacity of 400K per drive. Hard disk operations will be added in the future. This board plugs into the **Z-80** socket of the **Model III**, and users will have to open the machine and thereby void their warranty.

Another board being planned soon after the **CP/M** module will give the video monitor the possibility of 24 by 80 character display. With these features, the **Model III** will not only look like, but have most of the same capabilities of, the **TRS-80 Model II**.

3. **Hewlett-Packard** will shortly announce a **CP/M**-compatible computer comparable to the **TRS-80 Model II** in the \$7,000 price range.

4. **IBM** has announced a new computer, its smallest yet, called "System/23 Datamaster". Aimed at small businesses with 10 or fewer employees, it features an 80-character-per-second printer and is priced at \$9,830. The word-processing option costs an additional \$1,100 to \$2,200. The new unit replaces **IBM's 5120** "desktop" computer, which was previously the smallest made by the company and sold for \$13,375. It will no longer be made.

In addition, **IBM** is expected to announce an even smaller unit —

MD

MICRO-DESIGN

ANNOUNCES THE NEW MDX-3

**INTERFACE EXPANSION BOARD
INTERFACE EXPANSION BOARD
FOR THE TRS-80
MODEL III COMPUTER**

FEATURES:

- Phone Modem
- RS-232 Port
- Floppy Disk Controller
- Dual Density Data Separator
- Silk Screen
- Solder Mask
- User Manual

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The MDS-1**

- Plug in data separator for the MDX-2
- Fully assembled and tested
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FEATURES:

- Phone Modem
- 2K-4K E PROM Option
- 32K MEMORY Expansion
- Floppy Disk Controller on MDX-2
- Real Time Clock
- Parallel Port
- RS-232 and 20ma Serial Port
- Dual Cassette Line
- On Board Supply
- Silk Screen
- Solder Mask
- User Manual

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User Manual \$7.95

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a personal computer — soon. It is expected to be in production after the first of next year. By its own admission (which came out in testimony during an IBM/government antitrust case), IBM has been hurt by the proliferation of the microcomputer. A recent research study by the Gartner Group, Inc. of Greenwich, Connecticut (the report sells for \$3,200!) details the decline of IBM's share of the total market from 80% to about 30% or less. There is a market of 25 million computer users, and IBM won't ignore them.

5. Texas Instruments has decreased the price of the TI 99/4 home computer to \$649.95. The same unit originally sold for \$950! TI will be redesigning the keyboard into a "bigger key" typewriter keyboard with "standard home row keys". Announcement of this change will be withheld until TI sells out of its current 99/4 stock with its poorly designed calculator-like keyboard. The price of the newer 99/4A will be the same as the current 99/4. TI employees are being given the opportunity to buy a 99/4 at \$299 (below cost).

While the only difference be-

tween the 99/4 and 99/4A is the keyboard, the newer 99/4B will be a completely changed home computer. It will have simpler graphic capability with new 'Magnify' commands, a new extended BASIC, and 32K add-on memory expansion modules. Even though the company got off to a rocky start, TI is in the personal computer business to stay.

On another front, TI is now advertising one of the first 5 1/4-inch Winchester-type **hard disk drives**. Each drive can store **6.38 megabytes**. Prices are not being advertised.

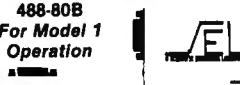
6. Atari has dropped the list price of the Atari 400 16K RAM version from \$630 to \$399 and lowered the 8K RAM version by \$100. The 8K Atari 400 will eventually be phased out. The 40-column printer is now \$299.95 (vs. the previous \$449.95). 8K and 16K memory modules were slashed by more than 50% to \$49.95 and \$99.95 respectively.

7. Apple Computer has been having big problems with its **Apple III**. The newspaper **Computerworld** recently reported a rumor that the Apple III was to be scrapped in favor of an Apple IV. New Apple III owners were complaining "about just about every facet of the system." Reported are problems with loose chips, faulty clock/calendar chips, inadequate cooling system, circuit boards, disk problems, and more. Apple has dismissed "most employees involved with the Apple III project, including project director Thomas Whitney". Apple has sold over 4,000 Apple IIIs and had to hold up shipments earlier this year because of "reliability problems."

But the news at Apple is not all bad. Its profit for the six months

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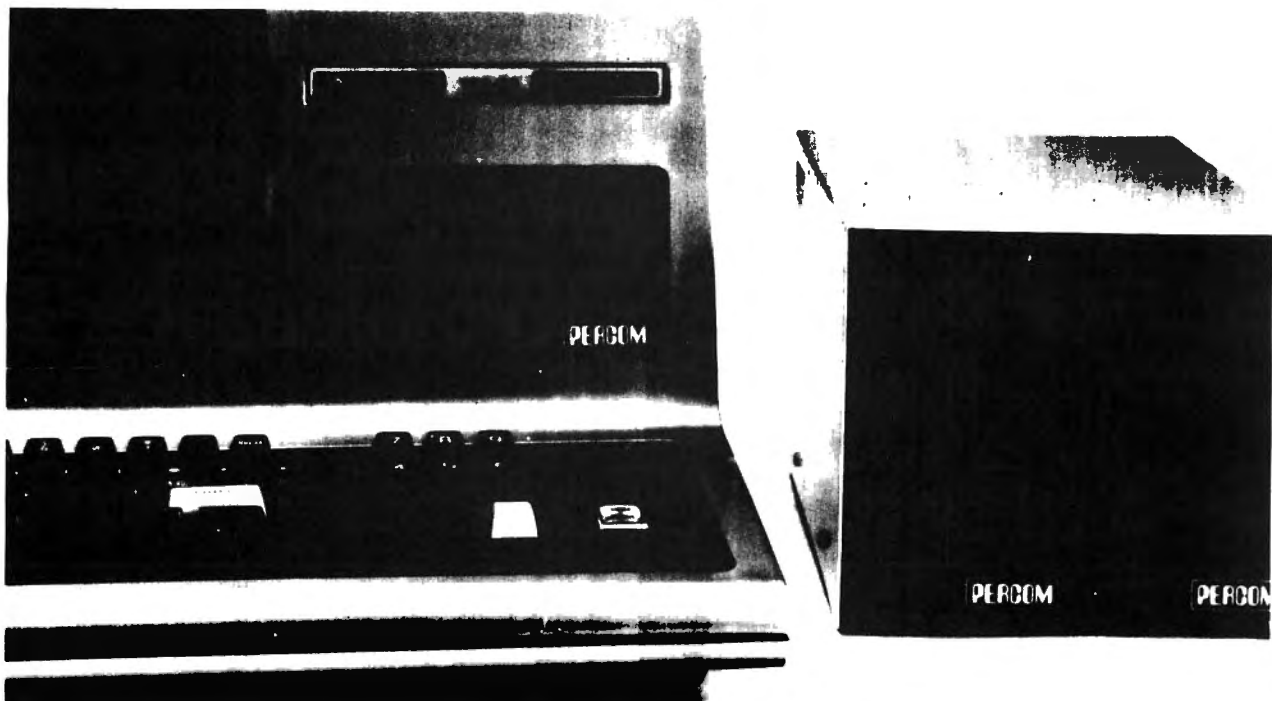
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Still #1 for the Model I

Besides greater storage capacities, more quality control measures and lower prices, all Percom Model I drives are rated for double-density operation.

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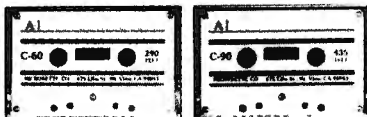
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continued from page 4

ended March 27th has skyrocketed to \$16.5 million, up from last years \$5.4 million — a 229% increase. Not bad for a company founded five years ago by two hobbyists named Steve in their garage!

8. Casio Computer Company has just started selling its \$170 **FX-702P hand-held computer**, with U. S. sales due later this year. This makes it the second manufacturer after Sharp Corp. to offer a calculator-sized computer capable of running BASIC programs. (The Radio Shack pocket computer is a Sharp.) Casio will soon have a cassette adapter for program and data storage for about \$35, and later it expects to have a miniprinter for hard copy output for about \$70.

GREMLINS

Go into BASIC and type three spaces followed by an apostrophe and ENTER. What happens? You get a "READY", because you have entered some information followed by the abbreviation for a remark.

Now type four spaces followed by an apostrophe and ENTER. What happens? Does anybody know why?

continued from page 2

author of the Beginner's Corner. Her name is Sherry M. Taylor, and she tells you a bit about herself and why she will be writing the column in this month's installment. Mr. A. Douglas Werbeck, the previous author, has taken a new job with Radio Shack, which created a conflict of interest with his writing for us. We wish Doug well in his new position, from which he will surely continue to help people who are just beginning an interest in microcomputing.

Authors' Addresses

It is our practice to publish the addresses of authors who write articles and programs published in *Computronics* when their material is published. If you submit something to us and would *not* like us to publish your address, please state this in your accompanying letter. Otherwise, we will assume that you do not object to having your address appear.

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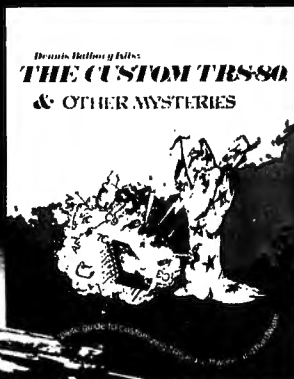
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LETTERS TO THE EDITOR

Problems with NEWDOS/80

I recently ordered NEWDOS/80 from your organization. When it arrived, the disk was loose in the box, and all of the manual pages were out of the binder. Most of the round holes were bent, torn or mutilated. There were numerous asterisks penned in the margins and some underlining.

As if this weren't enough, after reading the manual I find that there should have been a technical sheet and several ZAP sheets included. All of these were missing.

I am having some problems with NEWDOS/80 and wondered if you could be of assistance. Reading the Apparat manual has not helped much. (Surely this was written by an early Radio Shack manual writer.)

Most of my problems are business-types that build and store data on disk files under TRSDOS. They run fine under NEWDOS/80 until they hit a LOF or EOF command (these are incompatible, you know). Question: how do you make them compatible? Do you have to change the BASIC commands in the programs or rebuild the files with the input routine running under NEWDOS/80?

Any chance of starting a new series of articles on NEWDOS/80 similar to the one on assembly language?

I greatly enjoy your magazine. Keep up the good work.

J. H. Mecom
RT-1 Box 87A
Ennis, Texas 75119

We apologize for the condition of your copy. All orders are filled with items exactly as they come from the manufacturers. We have found that the ZAP sheets for NEWDOS/80 are often not included, but they can be obtained from Apparat as long as you are a registered owner.

There is no way to make NEWDOS/80's method of handling the last record in a file compatible with TRSDOS. Programs have to be modified to take the differences into account.

While we do not envision starting an entire series on NEWDOS/80 at this time, we have planned several articles to cover various aspects of it. In this issue we have an article on the SYSTEM and PDRIVE commands.

A New Utility for the Electric Pencil

In your April 1981 issue (number 33) page 19, Joseph Rosenman, in his review of the MX-80 printer, indicates that the feature of changing the print characteristics during printing would be nearly impos-

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sible to implement in Michael Shroyer's *Electric Pencil* program.

This is one of the main reasons why Programma International, Inc., has brought out *POINT*. With *Point*, you can send any control code, control-A through control-Z, also all escape code sequences, anywhere in the text, including between words, or even within words.

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Point works with the disk version of Michael Shroyer's *Electric Pencil* and is available from Programma International or most dealers for only \$49.95. *Point* also has a high-speed keyboard routine, by the way, and gives your TRS-80 all the power of a \$20,000 dedicated word processor.

Jeff Lasman
Project Coordinator
Programma International, Inc.
2908 North Naomi Street
Burbank, CA 91504

Word Processor "War"

For some reason I feel compelled to make some belated comments on your word processor war with Mr. Hinrichs. When I received my issue of *80 Microcomputing* in June of 1980, I immediately keyed in the program. When I brought it up, aside from a few typos, I had *no* trouble with it. I happened to run across your September 1980 issue and read the article "Problems with the Word Processor". Wow, what a mess! It is hard to believe that you folks had a bone to pick with Mr. Hinrichs. . . .

When I went to 32K, all I had to do was redimension the array. Also, with Dennis Kitsz's speed-up mod, I can type as fast as I want. Even without the speed-up the typing poses no problem.

It seems to me that there could not be too many ways to write a "back bone" program for word processing. Let's face it, BASIC is BASIC. What makes the program is its extensions and embellishments. Hinrichs nailed them and you didn't. It's that simple.

Now for some more bad news. Software piracy is something programmers *must* live with (look at the music business). I have read so many articles by people who are crying the blues about the problem. Well, the solution is to hit the market hard and heavy, sell as much as you can before the pirates get it, and learn how to code security in. You can cry all years. The pirates, in the meantime, are laughing and selling. I am sure you realize that the mark of a good program is its

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correctness and human engineering. Anything short of that is junk.

Paul E. Ericksen
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It's hard to imagine how you could have misunderstood so many of the points we made in our September 1980 issue, so let us restate some of them here. Our complaint was simply that Mr. Hinrichs had published what amounted to a modified version of our program, which we distributed for free, without acknowledging any indebtedness to us. At the time, we were not making a stink about software piracy, but the publisher of 80 Microcomputing was, and the irony seemed to good to pass up.

If you will read the article you referred to, you will see that most of the points relate to applications that were not even considered when the program was written, such as not using a Radio Shack printer. Computronics stands behind the programs that it publishes, and not only corrects mistakes, but takes the time to explain them.

We don't agree with your attitude about software piracy, which is becoming a more serious problem all the time, but it doesn't matter in this case because we were not even selling the program. The mark of a good program is not just that it is correct and useful, but also that it gets copied.

Some Questions from Aruba

I have a 48K Model I with two disk drives, modem and H-14 printer. I also have NEWDOS/80. I have been receiving *Computronics* for some time and can say that I am very pleased with it (great magazine). As you can see, I live on a very small island off the coast of Venezuela in the Carribean. Our main problem is support. The local Radio Shack dealer does not give any support in any way, so we are looking around the world for support and hope you will be able to help us. Here are some problems we have:

(1) We would like to have some addresses of schools that give homestudy courses in advanced BASIC (disk version, for the TRS-80).

(2) I am using a parallel to serial interface from Multimedia with my H-14 line printer, and I have some problems. It misses characters when printing, and it also stops printing after six lines. I would be glad for some advice from anyone, thank you.

(3) I would also like to hear from anyone who has or knows about the following programs:

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BASKETBALL LEAGUE STATISTICS

(4) Is there a better way to get rid of the corrosion

problems on the contacts of the keyboard, expansion interface, and disk drives? I mean a *permanent* one.

I hooked up to micronet a few times. It's great, but it is a very expensive joke for me. Using Videotex it works fine from overseas. For those who are interested, go right ahead.

R. L. Bromet
Piedra Plat 135-B
Aruba, N.A.

Since we can't answer most of your questions, perhaps some of our readers will be able to help you. There is a permanent solution to the edge connector cleaning problem, but we wouldn't recommend it to most users because it is very difficult even for experienced technicians. Roger Fuller sells a Silver Kit which requires you to flow silver solder onto each connector. His address is 630 E. Springdale, Grand Prairie, Texas 75051, telephone (214) 642-0441. The price of the kit varies with the price of silver.

The edge connectors of many other peripherals, including the disk drives, are gold and do not need to be cleaned. The rule is: if it's shiny, leave it alone.

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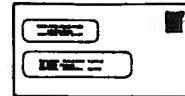
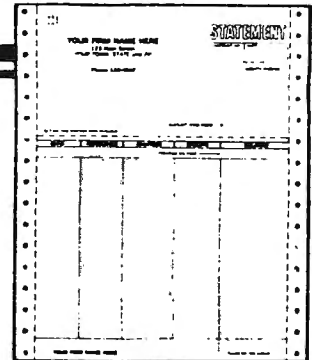
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PROGRAM PREVIEWS

A. A. Wicks

This Month: MICROPROOF

There are few things that provide greater satisfaction in microcomputing than word processing operations. Yes, there will be many who take exception to that statement, especially if their forte is not words and writing in any form. But the fact remains that being able to manipulate, change, add, delete, rewrite any type of documentation by way of a video screen, and have any of these redefined almost instantly, continues to entrance me, no matter how many times it is done.

There are many word processing programs available, and most of these are excellent — a few of the less costly leave much to be desired. But cost is not always indicative of how Valuable the system may be. Personally, I like SCRIPSIT™, and for the most part, it does most of the things that I need (is there an ultimate word processor yet?). One of the things that SCRIPSIT does not do, is to check for spelling and typographical errors in a document — and I really would not expect this within its cost bracket. However, it has been my good fortune to evaluate a program of immense value in this respect — MICROPROOF, produced by Cornucopia Software, and written by Philip Manfield.

Simply stated, MICROPROOF is a “look-up” program, which scans a document (prepared using SCRIPSIT or Electric Pencil™), and compares every word against 50,000 words held in a “dictionary” disk. Any words that do not match are displayed for further processing, that is, of course, if they are in the Dictionary. I have no idea what those 50,000 words are, and did not wish to take the time to find out, but, according to Cornucopia, they are the equivalent of Webster's Pocket Dictionary. I do know that I most certainly would not have enjoyed the task of typing them in as program data. (Think of it — if each word and a space averages 10 characters, and we type 10 characters to the inch, this would be a stream of words 416 feet long!)

MICROPROOF operates with a TRS-80 Model I, II, or III; requires 32K of memory and one disk drive as a minimum. This is a bare minimum — it is much easier to use with 48K of memory and two disk drives (excluding Model II). This review will be based upon an evaluation using SCRIPSIT and two disk drives, but all operations are essentially the same with Electric Pencil, and also with only one disk drive.

There are also two versions of the program itself. One, the Standard version, operates on a word-

processed document and then displays the words that are in conflict with the Dictionary. The user then performs a Global Search and corrects the errors by screen editing. The Correcting version — much to be preferred, operates integrally with the word processor, by displaying the word, allowing several choices of action (see below), and then automatically corrects the word in the file. This is the version to be discussed.

As with most disk-based programs offered today, this one has no Operating System. In most instances, incorporating a Disk Operating System (DOS) with the program is difficult only for one-disk system users. It is a chore, rather than a problem. For MICROPROOF I found that it was a chore, even with two disk drives. Single disk drive users of this program will probably have to gain access to a dual-drive system, or have NEWDOS™ available to copy the necessary files.

The disk for the second version of MICROPROOF, Correcting MICROPROOF, has files stored on both sides of a disk. Users who do not normally use two-sided disks should be cautioned to be careful in noting the cutout slot positions when inserting each side of the disk. The word processing program is “patched” with MICROPROOF. A program on the disk called SPATCH (for SCRIPSIT-Patch), does this. Then this disk, combining the functions of SCRIPSIT and MICROPROOF, has added to it three more programs required for the proper functioning of MICROPROOF. Still another disk is prepared from the original, this one to contain three “dictionary” files, called DICT1, DICT2, and DICT3. The last-named is “your” dictionary, where you may store words, jargon or abbreviations, etc. that you would like to have in the Dictionary. More about this later.

Preparing the second disk was when I found some work was necessary. According to the manual, a formatted disk was required for this one. Adding the three DICT files should not be a problem using the COPY command of TRSDOS, except, in this case, there was no system on the original MICROPROOF disk, and certainly not on the formatted disk. NEWDOS in its wondrous ways probably has a quick solution for this, but rather than work through its ponderous instructions, I opted to transfer the DICTs from the original to a “bare bones” TRSDOS disk, thence to a formatted disk. It only took a few minutes, but was a nuisance.

The third disk may be prepared as an option. It holds an example of a letter that is referred to in the text for instructional purposes. Normally, a third disk

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(or more), will be used for storing your documents that are being prepared, rather than storing the EXAMPLE file.

Once the backup composite working disks are prepared, operating with MICROPPOOF is easy and rewarding — if you can say that having your mistakes highlighted is rewarding! You start by using the first disk (SCRIPSIT/MICROPPOOF) in Drive 0 and the document disk in Drive 1. Of course, if you are working with a document in memory, this is not necessary. The normal SCRIPSIT video display appears at all times that you are word processing. A short command within SCRIPSIT is given and the display clears and states, "Insert Dictionary Disk..." Once this is completed, the document in memory is checked against the Dictionary — very quickly. A ten-page manuscript took about 30 seconds to check, at the end of which the screen displayed a list of words in tandem across the screen. While the check is occurring, one asterisk flashes very rapidly at the top right corner of the screen.

At this point some comment is in order regarding just what kind of words are checked and what words are displayed. The manual emphasizes that the words displayed are potential errors, and this is indeed so. I would rather be permitted, however, to check a suspicious word as it appears to MICROPPOOF, than to have it omitted from the displayed list. Words that are truly not errors may be passed over quickly. It is even possible for some misspelled words not to appear. As pointed out in the manual, a word such as "inclosed" will not appear as a misspelling. (The manual uses this word for an example, implying that "inclosed" is misspelled, when actually it is an alternative spelling — but you get the idea.) The reason the word will not appear is that it is treated as two words in evaluation — "in" and "closed." If it was "incloesd" however, it would certainly be treated as an error.

MICROPPOOF will also not display single letters, so it is possible that if the letter "s" had been typed where "2" should appear, then you have a non-displayed error — but note — not a misspelling.

Again as previously mentioned, some correctly spelled words may appear on this list. These will be mostly proper names, or abbreviations; for instance, "Maryellen," and "ASCII." If you want these correctly spelled words to be eliminated from future displays, you do have the option of placing them in DICT3.

MICROPPOOF accepts hyphenated words too, including end-of-line hyphenations, although there can be exceptions to the latter, depending upon the word division. MICROPPOOF considers them as two (or three — see "end-of-line" above), words, but divided words may not end up being Dictionary words.

Following the total display of all of the words that

have been excepted, an "Enter" brings up a new display. This display requests that you choose from one of the following:

- Correct the misspelled word
- Leave the word "as-is"
- Add the word to the Dictionary
- Exit

The word selected as "incorrect" is displayed and your response is awaited. One at a time, these are the words that were previously displayed across the screen. A word selected by the Dictionary as misspelled will appear in each instance that it is encountered within the document. The third choice above allows for a "coding" option. Selecting a code for a word when placing it in the Dictionary will permit suffixes to the word to be recognized when the Dictionary is again scanned.

After completing an entry as in the above, an "Enter" brings up the next word and choices, until the last word has been reviewed. You are then requested to insert your document disk, and your document is corrected in just a few seconds, with SCRIPSIT then displaying the document in its corrected form. You are now ready to print your document.

It is not necessary to wait for a word to appear in a "misspelled" list in order to add to the Dictionary. This may be done at any time the program is in operation. A good time to do this might be immediately before a word-processing session, when you know you will be using a number of abbreviations or proper names, which may be used also in future documents. The disk containing the program ADDTODIC is placed in Drive 0 and a formatted disk in Drive 1. Using the word processing program, a word is entered and coded (if desired), for suffix flagging. Each word is then "ENTERed." At the completion of your list, it is SAVED to the formatted disk in Drive 1. Returning to DOS, ADDTODIC is called, and a short series of commands ultimately results in having your new words included with your Dictionary disk. The statement, "Dictionary Expansion Completed," concludes the action. Although we discussed two-disk drive systems in the foregoing, single-drive users are assured that complete instructions for their guidance are also included in the manual. A not very important point — mostly because added words take so little space on a disk — but there seems to be no way to remove a word from the "personal" Dictionary, once it is created.

Note: The document may be processed with your word processing program without including MICROPPOOF until proofing time. For familiarization, I practiced with some months-old SCRIPSIT files and turned up several unexpected typographical errors in a supposedly error-free document.

The manual comprises 25 single-sided pages on

Bond paper 8-1/2 by 11 inches, and is printed from electric typewriter or daisy wheel printer composition. The sheets are stapled, and are not pre-punched or otherwise bound. The manual was written by Richard Bidleman, and is very good indeed — the author is to be complimented on his excellent exposition. Writing style is succinct yet extremely informative, and has not one word that may be considered as computer jargon — thus making it valuable to persons not exposed to computer programming. Composition and layout are excellent, the examples are clear and concise, and significant use has been made of footnotes, which allows the reader to maintain a clear perspective on the item under discussion, without obfuscation.

The Introduction provides an excellent overview of the program and its intent. A very brief Quick Reference Guide can be used to get into operation immediately if desired, and for future reference. I notice that several program producers are commencing to include a section such as this, and think it should be encouraged. There is a great sense of accomplishment to be gained on the part of the purchaser if the program can be run at once, with the details to be looked at later — or never, if that is sufficient.

Yes, the manual is fine — it gets my rating of a 7 on a scale of 1 to 10. It would have been an 8, had it had a light card stock (or better) front and back cover of some sort, and had it been, perhaps, three-hole

punched. The cost of a program should dictate that the manual be a good document in all respects. By the way, there was one spelling error and one typographical error. (Sorry, Cornucopia! I couldn't let that go by.)

I had no problems loading or running this program whatsoever — what a nice change from many that are available! All functions occurred when they should, and as they should, in accordance with the sequences described in the manual.

The summary review of this program? One word — Excellent. I highly recommend it for anyone using a word processor for any need — articles, manuals, reports, and even letters of substantial length. The programs I am finding lately seem to be getting much better, and this is one of them — does this mean the less useful and poorly produced ones are falling away? I hope so.

- MICROPROOF, Cornucopia Software, P. O. Box 5028, Walnut Creek, California 94596.

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- UPDATE the program by entering weekly scores.
- Set up a new SEASON



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STATIC ELECTRICITY and the MICROCOMPUTER

Dany J. Washington

One of the most annoying problems that programmers encounter when dumping programs onto cassette tapes is static electricity. After endless hours of saving (CSAVE) and verifying (CLOAD?) programs only to be rewarded with an improper (bad) dump, I searched the literature for suggestions on eliminating this electrostatic monster. Alas, the literature is scarce and sparse, and only superficially eludes the topic.

Since necessity is the mother of invention, I decided to tackle this problem actively by devising some strategies (mainly by trial and error) and observing their effects on this electrical phenomenon. In very quiet rooms the static electricity can be heard if you put your ear near the keyboard and video screen. There is a slight popping or crackling sound.

The following is a list of precautionary procedures, one or a combination of which will help eliminate or reduce static electricity:

1. Always verify your programs by using CLOAD? to make sure the program was recorded correctly (bit-by-bit). Static electricity usually affects saving programs, not loading.

2. Use microcomputers in rooms whose floors are bare (wood or tile). Most carpets are producers of static electricity.

3. If it is not practical to remove carpet from the microcomputer area, use rubber or plastic mats in the most widely walked areas.

4. Avoid wearing static-producing clothes near the microcomputer when saving programs, or use a static spray for clothes before programming or saving programs.

5. If it is economically feasible, it is a good idea to get a simple instrument that measures humidity and temperature. Humidity is the best indication of days that are static prone. The ideal humidity is 50% or more. If it is below 40%, beware!

6. Static electricity can affect not only magnetic cassette tapes, but also the computer's memory. It can also cause the computer to "lock up". A simple electroscope brought between the keyboard and the video screen also detects static electricity and can be an inexpensive detective in finding the culprit.

7. In very dry climates or during certain seasons, a

small room humidifier is helpful in reducing static electricity. However, most humidifiers are costly and are not needed continuously.

Although I have given you a list of the most conventional methods used for combatting electrostatic bad dumps, there are still some inexpensive household remedies that I have found to be most effective. The following list contains some practical solutions if the electrostatic monster raises its ugly head:

1. One of the greatest producers of static electricity is the video screen. When saving a program, turn the video off and depend on the cassette light, cassette counter or the cassette clicking sound indicating the dumping is completed. You can turn the video screen back on for verifying (CLOAD?) or depend on your cassette recorder's counter for proof.

2. On low-humidity days always destaticize your clothes before saving a program. Spray your clothes or ground your body by touching a metal object such as a door knob.

3. Placing the cassette recorder on a sheet of Bounce fabric softener (or some comparable brand) also helps to attract static away from the cassette recorder and tapes.

4. Radio Shack produces a cassette tape called Realistic which is half the price of its Microcomputer tape and performs just as well on microcomputers. However, Realistic tape is affected more by static electricity, so make sure you have low static before using it.

I am sure that the experienced programmer knows all of these tricks of the trade. However, no one has stated them all for the novice. If these precautions and solutions seem too much of a bother, the ultimate solution is to buy a disk system, which is not as sensitive to static electricity.

Dany J. Washington
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... is stored along with the rest of the program in the "memory". At the end of every line and before the next line is an "END OF RECORD" marker. The "END" is a hexadecimal "00".

... the "memory" is divided into "lines". The "memory" is divided into "lines". The "memory" is divided into "lines".

... the "memory" is divided into "lines". The "memory" is divided into "lines". The "memory" is divided into "lines".

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CALL B2C ASCII To Binary
Converts the ASCII string pointed to by HL to binary. If the string is longer than 255 characters, the string will be truncated to 255 characters. If the string contains a decimal point or a '+' or '-' character, the string will be converted to integer to double precision. The binary value will be left in WRA1 and the mode flag will be set to the mode flag value.

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COLOR COMPUTER CORNER

Joseph Rosenman

Radio Shack did it again. When the Model I first became available, no one dreamed that it would become as popular as it did. Indeed, I have no doubt that the entire future of home computers would have been quite different if Radio Shack had never entered the field. Once, the Model I was a small (and inexpensive) machine. Remember Level 1, 4K? Radio Shack managed to capitalize on the remarkable success of the Model I, and developed the Expansion Interface, disk, etc. The rest is history.

The newest member of the TRS-80 family is the Color Computer. Unconfirmed rumor has it that the sales of this computer have reached 6 digits — after less than a year! Further (unconfirmed) rumor has it that a full scale Color Computer Expansion Interface is nearly (or is already) developed, and should be available some time next year. Because of the dramatic success of the Color Computer, **Computronics** has decided to include a section devoted to the Color Computer as a regular feature. In this monthly column, I will write about new developments related to this computer, along with some software reviews and (hopefully) some programs. I will also conduct a Question/Answer section about the Color Computer, so start writing! (Please state "Color Computer Question" on the envelope.)

The best place to begin is with a review of the 4K Color Computer. Like the Model I, the Color Computer comes with a "Level 1" and a "Level 2" configuration. In this case, the "Level 2" is called "Extended Color Basic". Next month, I will write about the Extended Basic. I expect that most of the future articles will focus on the larger Extended Basic configuration (unless there is a large and vocal group of Color Computer users with only regular Color Basic). The upgrade is relatively inexpensive, and *significantly* adds to the power of the machine. I expect that most users will either quickly purchase it or buy their machines with Extended Basic right from the start (by far the best idea).

THE 4K COLOR COMPUTER

The Color Computer is a small and attractive unit. The physical cabinet measures only (about) 14 by 14.5 by 4 inches. Like the other TRS-80 microcomputers, this unit is encased in sturdy plastic. The Color Computer includes a cassette port, 2 joystick ports, a serial printer port (RS-232-C), and a ROM cartridge plug in area. There is no obvious Expansion Interface connection. There is also a connection jack for the video signal, and a switch to determine which channel will be used (3 or 4). Believe it or not, the video cable

is simply a standard RCA type audio cable (exactly like the kind you have on your home stereo system). In addition to the actual computer, the necessary documentation *and* the TV adapter for the computer are included. Considering the cost, not a bad bargain. There is a catch, however. (Isn't there always?) You must supply the TV. A 12 or 13 inch color TV works best. The good news is any standard TV will work. It is a simple switch of a lever to toggle between "computer display" and "normal television". What else is missing? Plenty! If you plan to do any programming, you must have a cassette recorder in order to store and retrieve programs that you write or buy from others. Radio Shack recommends their CTR-80 (of course). Actually, it is a good cassette and has proven itself very reliable with the TRS-80 computers. If you want a printer, you will need to plan for that expense as well. (Remember, it must be a serial printer, or a regular printer with a serial adapter.) The joysticks cost about \$25 for the pair. I believe all the Radio Shack ROM games require them (more on the ROMs later). The keyboard on the Color Computer is a little weird. The keyboard is arranged like a standard QWERTY keyboard but uses square buttons instead of keys. It takes some getting used to, but it does work. I suspect this design helps make the Color Computer dirt resistant. Speaking of cleanliness, don't forget to purchase a dust cover for your Color Computer. Radio Shack sells a good, strong, vinyl cover for only \$4.95 (a genuine bargain). The Color Computer also has lower case — well, sort of. The way lower case appears on the screen is in "reverse video" (usually green on black instead of black on green). If text is stored or printed, the lower case will appear the way it is supposed to.

The documentation that is included is frankly non-technical. For the beginner, this manual will take you from square 0 on up. For a more advanced user, the urge is to skim through it, and likely miss several important points. So, along with this review I will describe what I think are the most important differences from the Model I/III systems. For any readers who are new to the TRS-80's, the manual is the best place to begin.

The 4K machine contains just that: 4K (4096) bytes of memory. The ROM (Read Only Memory) that contains the Color Basic is 8K in size. The microprocessor used in the Color Computer is the Motorola 6809 (a 16 bit microcomputer). Along with the keyboard/computer, there is a TV modulator/interface box and cable. The Color Computer can work on either channel 3 or 4 and does not require a special TV. It is, however, advisable to select a small screen size (Radio

Shack suggests their 13 inch TV) in order to provide good video resolution. The cassette recorder is pretty much a requirement, since it is the only way a program can be saved short of typing it in each time you want to run it. As I describe the features and limitations of the Color Computer, bear in mind that many aspects of this BASIC are enhanced in the Extended Color version.

The video screen is 32 characters across by 16 lines. The Color Computer can produce nine distinct colors:

- | | | |
|-----------|-------------|------------|
| 0) BLACK, | 1) GREEN, | 2) YELLOW, |
| 3) BLUE, | 4) RED, | 5) BUFF, |
| 6) CYAN, | 7) MAGENTA, | 8) ORANGE |

Text will appear black on a green background (or green on black if lower case). To get into lower case mode, type SHIFT-0. A second SHIFT-0 will return you to ALL CAPS mode. The Color Computer also has graphic blocks, where each block has four "quadrants". Any portion of the block can be set or reset, but you can't set different colors in the same block. Since the video screen is 32 by 16, the proper range of SETs and RESETs is 0-61 and 0-31. In addition, there is a color field in the command (0-8). To set a block red in the middle of the screen, type: SET(31,15,4).

A small technical aside: there are 16 different graphic blocks for each of the eight colors. Black is considered "OFF". $16*8=128$; it just so happens that all the ASCII codes from 129 to 256 are reserved for graphic blocks (a total of 128 codes). The 16 codes for GREEN are numbered 129-143, for YELLOW they are 144-159, etc. If you try to SET different parts of the same block to different colors, the "SET" portions will all be converted to the most recent color (i.e. the color of the current SET).

Now, what about these ROMS? Are they a new kind of mantra? No, ROM stands for Read Only Memory. A ROM is an Integrated Circuit (IC) containing information that can't be erased or over-written, just read. Within your Color Computer, there are ROMs that give it its personality. Normally, the microprocessor (in this case the 6809) can't do a thing, because it doesn't know what to do. It knows *how* to do it, but not what to do. The ROM tells it what to do. In the hardware of the computer, there is a special circuit that tells the microprocessor where to begin execution whenever it is turned on. That place (or address) is the beginning of the Level 1 ROM. One of the first things the ROM will *do is to clear the screen and announce itself*, "Hello, I'm here and alive". It also checks to see whether it is an "Extended Basic" ROM or not. After it has finished starting (initialization), it waits for you to ask it something — that is, it tells the computer to accept input from the keyboard, store it in a buffer, and to "jump to the keyboard input interpreter" when the

enter key is pressed. When enter is pressed, it then looks at what you just typed in to see whether it can make sense of it or not. If it understands what you just typed in, it will execute it, or "Do whatever you asked". If it can't make sense out of what you typed in, it will display an error message and wait for you to type something else. The error message will indicate what it didn't understand in your request. Things you might ask the computer to do include the assignment of values to variables (A=23 or B\$="HI"), the display of variables (PRINT A), the execution of functions (CLS or POKE), etc.

The Internal ROM makes a "computer system" out of the microprocessor. By adding additional internal ROMs, a system could be expanded. Of course, the original design must include a space for any additional ROMs. What Radio Shack did with the Color Computer was to provide a means for a special ROM to "temporarily" take over the computer's personality. If, upon power up, the internal ROM discovers that there is an external ROM plugged in, it will abandon its own power up procedures and direct the microprocessor to "go to the address of the external ROM, and do whatever it says". The external ROM could contain anything. For the moment, all that is available are games and a memory test utility. What are the advantages of cartridges (over cassette or diskette)? They are very simple to use, they can't be erased, they are permanent (the media doesn't wear out the way cassettes and diskettes do), and they are hard to duplicate. What are the disadvantages? They are expensive, the storage capacity is limited, and (ironically) they are hard to duplicate. Personally, I suspect that one of the reasons that Radio Shack opted for the ROM cartridge was to "strongly discourage" software pirating. Since accidental erasure of the program is nearly impossible, the legitimate reasons for backups have been mostly eliminated. They also are easier to use, and a large number of Color Computer users are novices in the computer field.

The Color Computer Basic includes several new commands, and variants on familiar commands. What follows is a description of some of these new commands. Color Computer Basic supports only single precision or string variables. Both the integer and double precision type are not supported. (There is an INT function, however.) The largest value the computer can handle is (ABS(X)>IE38).

AUDIO: This command can route the audio output of the cassette to the television speaker. Options are ON and OFF.

CLEAR: This command serves two functions. It reserves string space, and sets a high memory limit.

CLOADM: This command permits the loading of

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EPSON MX-70: A USER'S EVALUATION

Brett A. McAlister

It was February when I learned that I was going to have a large enough income tax return to purchase a modest printer. It was going to have to be quite modest though — no more than \$500.00. Since I had a bit of a wait to receive my check, I thought that I might do well to make myself a shopping list and look around. My shopping list was nothing other than a list of features that I wanted on my printer. For instance, a 5X7 dot matrix would be fine for my modest needs, though I insisted on having both upper and lower case letters. I wanted to have good control of the printer via my software, and I felt that the line length must be at least 80 characters. A friction feed and tractor feed would be nice, so that I could use inexpensive roll paper as well as have the ability to print mailing labels for my Christmas cards. I felt that the best interface method was parallel (it's also less expensive than RS-232). The manufacturer would have to be fairly reputable, and repair facilities easily accessible. Above all, the price would have to be less than \$500.00.

With this list in hand I took to the magazines and journals and read hundreds of advertisements. Many printers had all of the qualities that I wanted and then some — EXCEPT THE PRICE! Of those that fit my price range, the Epson MX-70 seemed to fit the best. 5X7 dot matrix: check. Upper and lower case: check. 80 Characters per line: check. Parallel interface: check. Adjustable tractor feed but no friction feed: well, semi-check. Epson is a well known manufacturer of the MX-80, a fairly high quality printer. The ads didn't say much about software control except that it has "programmable line feed and form lengths." The cost is less than \$450.00: SUPER CHECK. But that's not all! This so-called bare bones printer includes a self test function, a low cost easily replaceable print head and a high resolution graphics mode that isn't even available on the MX-80. I knew that this was my printer.

I decided to go down to the local computer store and get a look at this wonder. Guess what? They had never heard of the MX-70! "MX-80? Sure, we carry them. How many would you like?" After I showed them the ads in their magazines, they realized that such a printer did exist. I asked them to check on the availability and price. They said they would. Since I am the impatient type, I didn't look into the mailorder route. About three weeks later I went back to the store and they had MX-70 printers all over the place. It seems as if they couldn't keep enough on hand. I don't think that finding one is going to be a problem for anyone who wants to buy an MX-70.

After a few more weeks (seemed like years) of hovering around the mail box, the check came. Within

hours I had the MX-70 in the back of my car. Since I bought it off the shelf and didn't want to wait for a cable for my TRS-80 Model I without expansion interface (I don't even know if Epson makes a cable to fit this configuration), I stopped by the Radio Shack store and bought their Printer Interface Cable (cat. No. 26-1411). Now I'm set.

Upon getting home, I immediately began unpacking my MX-70. After emptying the box, I found that I had a Printer, an operation manual, a paper separator and a ribbon cartridge. The printer is housed in a brownish-mustard colored high impact plastic case. It has a clear grey smoked cover over the carriage so that you can see what is being printed while the noise is kept down. On the top right front there is a small panel that has a power paper feed button and a small pilot light. There is also a typewriter style manual paper feed knob on the right side. The power switch is well out of the way near the back on the right side. I noticed that the printer could be operated with its left side up against another piece of equipment, since all of the controls are on the right. A nice piece of planning.

The operation manual seemed to be a bit small when compared to other such manuals that I have seen. It measures 6 3/4" by 8" and contains only 35 pages. It is divided into 5 parts: (1) introduction, (2) specifications, (3) installation, (4) operation and (5) maintenance.

The paper separator is used to keep the incoming paper from fouling with the outgoing paper. It is constructed of welded wire with a plastic roller. It mounts easily in holes in the printer housing.

The ribbon cartridge is labelled "long lasting" and installs very easily with no mess. I haven't tried to find a new cartridge as yet so I don't know how much of a problem that might be.

The initial setup is very easy and well explained in the operation manual. The manual has excellent illustrations to help you along the way, and even the least mechanically inclined should have no problems here. When you have completed the setup you are not yet connected to the computer. However, you can perform the print test now. Merely hold down the FEED button while you turn on the power and the printer continuously prints it's entire list of characters. To stop the test, you must turn off the power.

Now comes the interface with the TRS-80. I plugged in the Printer Interface Cable (which has a little black box containing the circuitry to drive the printer) into the back of the keyboard assembly. When I tried to plug the other end into the printer, I found that the cable retaining clip on one side of the socket would

not move far enough out of the way. This was easy to solve. I removed the clip. The plug then went right into the socket. Now for power and I'm on my merry way. NOTHING HAPPENS!! After rechecking all connections and reading the operation manual as well as the book that comes with the cable, I find that the little black box needs +5 vdc on pin # 35 of it's edgcard output. I also note that the ribbon cable has only 34 lines. Looking again at the cable book, it says that the printer must supply +5 vdc to the black box. Via a phone call to Epson, I found that if I used the printer to supply the +5 vdc, I would void my warranty. Luckily, I just happen to have a +5 vdc power supply. After hooking it up, it worked.

In the text mode, the MX-70 prints the 96 character ASCII set. Like most printers, the up arrow used for exponentiation is printed as a left bracket. There are two character formats: 80 characters per line and 40 characters per line. In the 80 character format, the characters are printed using a 5X7 dot matrix. In the 40 character format, the characters are printed double width with a 10X7 dot matrix. I didn't need to worry about software control of the printer. You have complete control with the exception of turning the power on and off.

Here is a short summary of the commands:

Carriage return.....CHR\$(13)

Also performs a line feed on TRS-80

Line feed.....CHR\$(10)

Form feed.....CHR\$(12)

Advances paper to top of form. Form length is set by the next command.

Form length.....CHR\$(27);CHR\$(67);CHR\$(n)

n = length of the form in lines

Max n = 127

Normal line is 1/6 inch but can be set at multiples of 1/72 inch.

Line spacing.....CHR\$(27);CHR\$(65);CHR\$(n)

n = number of 1/72 inch increments

Max n = 85

Return line spacing to 1/6 inch

... CHR\$(27);CHR\$(50)

Print expanded characters.....CHR\$(14)

Stays in expanded character format until a return to standard character format command is received or a carriage return is executed.

Return to standard character format...CHR\$(20)

Also....CHR\$(27);CHR\$(14)

Automatic upon a carriage return. Permits mixing expanded and standard characters on the same line.


The printer will operate properly with every TRS-80 print command except the PRINT "at" command.

The graphics mode is called the "Bit Image Mode" in the manual. While in this mode, every byte sent to the printer defines which dots of a vertical column of eight dots will be printed. The horizontal spacing of the dots is 1/60 inch and the vertical spacing is 1/72 inch. Since the graphics command specifies how many bytes is to be printed in the graphics mode. The opportunity exists for graphics and text to be intermingled. The truth is that it takes quite a bit of practice to perfect the technique. The command to enter the graphics mode is

CHR\$(27);CHR\$(75);CHR\$(n1);CHR\$(n2)

where n1 and n2 define the number of bytes to be printed in the graphics mode. N1 = the low order byte and n2 = the high order byte. You determine these numbers the same way you do the address that you poke into memory prior to a USR call with LEVEL II BASIC (see chapter eight in your LEVEL II manual). The max number of dots per line and the largest number you can define with n1 and n2 is 480. There is one

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MODEL III CORNER

Hubert S. Howe, Jr.

Some Details about Model III Disks

We have still not verified whether some of the Model IIIs already shipped by Radio Shack actually have double-sided disk drives, but we have spent some time investigating other aspects of the Model III disk system. The Model III's disk controller chip is the Western Digital 1793, which is one of the most powerful disk controllers yet made. It is capable of supporting double-sided drives as well as double density (which is standard). The standard disk drives are made by Tandon, and they have one of the fastest track seek times of any disk drives made. For this reason, Radio Shack employed these superfast seek times in its TRSDOS software, making it impossible to connect most other makes of disk drives to the Model III without employing an altered DOS. The only other original equipment manufacturer making disk drives that can be used on the Model III is MPI, whose drives are used in the Vista V-80 and others. (You might consider these for add-on drives.)

The disk controller is interfaced to the computer through I/O ports F0-F4 hexadecimal (240-244 decimal). These roughly correspond to locations 37E1 and 37EC through 37EF hexadecimal on the Model I. However, the Model III has some other aspects to its operation which we don't completely understand. Before you can output a value to these ports, you must "prepare" the bus by outputting a value to various other ports in the range E0-EC. Apparently some aspects of the Model III disk system are so flakey that the TRSDOS software has to make several attempts before completing an operation. This was also true on the Model I, but the number of times such retries were actually made was much smaller.

A new version of the DOS, TRSDOS 1.3, has recently been released, and it apparently corrects many errors that were in TRSDOS 1.1 and 1.2. Disk BASIC programmers will be happy to learn that variable files are fully operational now, although you must type, for example, "3V" in response to the question "How many files?" rather than "3,V" when entering BASIC. TRSDOS 1.3 also works correctly with the patched version of Apparat's EDTASM that has been described previously in this column. The August issue of Radio Shack's *TRS-80 Microcomputer News* details a few bugs in the first release of TRSDOS 1.3, but these are minor compared to the bugs in the other versions.

Through personal experience, we can verify that disk errors occur very frequently on the Model III. A Radio Shack repairman claimed that the disk drives

should be aligned every three to four months to insure proper operation. Disk alignment is a complicated procedure that must be carried out by a technician with an oscilloscope. It will cost you about \$50 at a Radio Shack repair center. One of the main reasons for the increased frequency of errors is that double density operations on 5-1/4 inch disks allow far less tolerance than single density. You must employ only the best diskettes and be very careful when handling them. Nevertheless, we suspect that there may also be bugs in the disk operating system, because, for one thing, we don't get as many errors when operating under DOSPLUS. We will continue to investigate these problems and report on them when we have any hard facts to disseminate.

This month our Crystal Ball Department reports on a board being developed by Lifeboat Associates that will enable standard CP/M to run on the Model III. It will also remap the ROM and will probably employ a larger number of sectors on each track of a diskette to provide an even greater storage capacity. We are also informed that this board will incorporate double sided operations if there is any way to achieve this on standard Model IIIs. When we get one of these boards, we will probably be able to investigate the characteristics of the disk system in even more detail, and to understand whether the increased errors are a result of the operating system or of faulty media or other causes.

Consider a Model III for Business Applications

Another board being developed by Lifeboat will allow the video display to be changed from 16 lines by 64 characters to 24 lines by 80 characters, identical to the Model II. Apparently this is not a complicated modification, and Radio Shack must have considered this option when designing the Model III. We can imagine that there are at least two reasons why RS did not choose it. First, there is already much software developed for the Model I that employs the 16 by 64 screen, and this would immediately become obsolete. Second, it could possibly hurt the sales of the Model II. When you compare a Model III to a Model II, there is an immediate visual reason for preferring the Model II for professional or business applications. You can also run CP/M on the Model II.

When a Model III is enhanced by these boards from Lifeboat, it begins to compare very favorably to the

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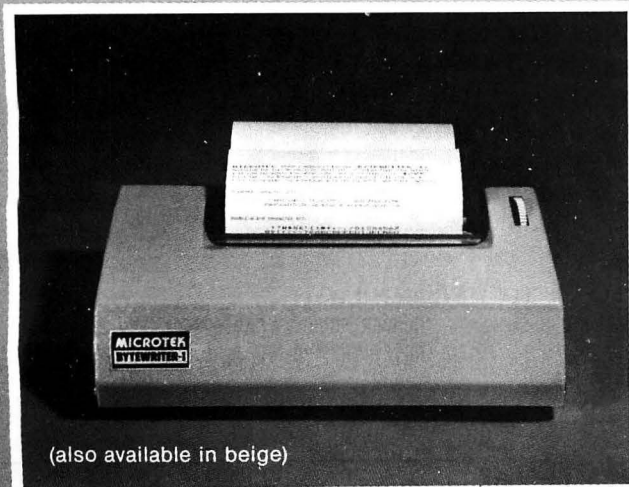
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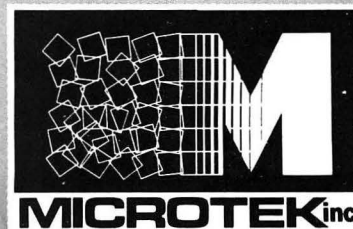
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FOUR BASIC PROGRAMS

Gordon Speer

DETERMINANT OF ANY MATRIX

A reader in Florida has written a subroutine to find the determinant of any size matrix, which we recommend you add to the end of Chapter 6 in your Level-II BASIC Reference Manual, to go along with the matrix subroutines which are already there.

This is a method of solving a series of equations in a series of unknowns, such as might be involved in logistics, or PERT charts, or various economics applications.

He has added a set of sample data to the subroutine to illustrate the formatting of the equations, and the necessary steps in calling the routine and retrieving the results.

In this example the equations would read:

$$\begin{aligned}7x + 6y + 3z &= 19 \\3x + 2y - z &= 7 \\x + 4y + 2z &= -2\end{aligned}$$

and if you solve them correctly you will find that x, y, and z have values of 4, -2, and 1.

As you might expect, as the matrices get larger the routine takes more time, but if you are patient it should be suitable for rather large problems. It was sent to me in compressed form, occupying only 13 lines of programming. I have expanded it to make it a little easier to read.

```
300 DATA 7,6,3,19
310 DATA 3,2,-1,7
320 DATA 1,4,2,-2
330 GOSUB 40100
340 PRINT "B1="B(1), "B2="B(2), "B3="B(3)
999 END
40100 'SUBROUTINE TO FIND THE DETERMINANT OF ANY MATRIX
40110 ' AUTHOR: J. T. CANFIELD, BARRY COLLEGE, MIAMI, FL 33161
40120 INPUT "NUMBER OF ROWS";NR
40130 DIM I(NR,NR+1), Q(NR+1), B(NR)
40140 FOR J=1 TO NR
40150   FOR K=1 TO NR+1 'ONE MORE COLUMN THAN NUMBER OF ROWS
40160     READ I(J,K)
40170   NEXT K
40180 NEXT J
40190 FOR NM=1 TO NR+1
40200   FOR N=1 TO NR
40210     LET Q=1
40220     LET C=N+1
40230     FOR R=1 TO NR
40240       LET C=C+1
40250       IF C > NR THEN LET C=C-NR
40260       IF C=NM-1 THEN LET C=NR+1
40270       LET Q=Q*I(R,C)
```

```
40280   IF C=NR+1 LET C=NM-1
40290   NEXT R
40300   LET Q(NM)=Q(NM)+Q
40310   NEXT N
40320   LET C=0
40330   FOR N=1 TO NR
40340     LET Q=1
40350     LET C=C+1
40360     FOR R=1 TO NR
40370       LET C=C-1
40380       IF C < 1 THEN LET C=C+NR
40390       IF C=NM-1 THEN LET C=NR+1
40400       LET Q=Q*I(R,C)
40410       IF C=NR+1 THEN LET C=NM-1
40420     NEXT R
40430     LET Q(NM)=Q(NM)-Q
40440   NEXT N
40450 NEXT NM
40460 FOR N=1 TO NR
40470   LET B(N)=Q(N+1)/Q(1) 'VALUE OF EACH VARIABLE
40480 NEXT N
40490 'AT THIS POINT THE VALUE OF EACH VARIABLE IS STORED AS B(N)
40500 RETURN
```

ABUNDANT NUMBERS

In one of his books, Steven Rogowski has a problem for computer solution to find abundant, deficient and perfect numbers. He defines a number as abundant if the sum of all of the factors of the number, including 1, exceeds the number. Some numbers are so abundant their factors total more than twice the number. I expected the best ones to be 24 and 144, my favorites, and was surprised to find they weren't.

I didn't run this very long, but observed that abundant numbers all seem to be even numbers. Does anyone know whether there are any odd ones? We could try running the computer all night and looking for an odd, abundant number by starting with the number 1 and stepping by 2.

```
100 ' ABUNDANT
110 CLS
120 DEFINT N,F
130 PRINT "NUMBER","SUM OF FACTORS","RATIO"
140 LET N=N+1 'GENERATES NUMBERS
150 FOR F=1 TO N/2 'FACTORS
160 IF N/F <> INT(N/F) THEN 180 'EVENLY DIVISIBLE?
170 LET S=S+F 'SUM OF THE FACTORS
180 NEXT F
190 IF S < N THEN 210 'DEFICIENT
200 PRINT N,S,S/N 'NUMBER, SUM OF FACTORS, RATIO
210 LET S=0 'RESET THE SUM TO ZERO
220 GOTO 140
```

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An all-inclusive version of this most popular of card games. This program both BIDS and PLAYS either contract or duplicate bridge. Depending on the contract, your computer opponents will either play the offense OR defense. If you bid too high, the computer will double your contract! BRIDGE 2.0 provides challenging entertainment for advanced players and is an excellent learning tool for the bridge novice. See the software review in 80 Software Critique.

HEARTS 1.5 (Available for all computers) Price: \$15.95 Cassette/\$19.95 Diskette
An exciting and entertaining computer version of this popular card game. Hearts is a trick-oriented game in which the purpose is not to take any hearts or the queen of spades. Play against two computer opponents who are armed with hard-to-beat playing strategies. HEARTS 1.5 is an ideal game for introducing the uninitiated (your spouse) to computers. See the software review in 80 Software Critique.

POKER PARTY (Available for all computers) Price: \$17.95 Cassette/\$21.95 Diskette
POKER PARTY is a draw poker simulation based on the book, POKER, by Oswald Jacoby. This is the most comprehensive version available for microcomputers. The party consists of yourself and six other (computer) players. Each of these players (you will get to know them) has a different personality in the form of a varying propensity to bluff or fold under pressure. Practice with POKER PARTY before going to that expensive game tonight! Apple Cassette and diskette versions require a 32 K (or larger) Apple II.

CRIBBAGE 2.0 (TRS-80 only) Price: \$14.95 Cassette/\$18.95 Diskette
This is simply the best cribbage game available. It is an excellent program for the cribbage player in search of a worthy opponent as well as for the novice wishing to improve his game. The graphics are superb and assembly language routines provide rapid execution. See the software review in 80 Software Critique.

EDUCATION

TEACHER'S PET I (Available for all computers) Price: \$11.95 Cassette/\$19.95 Diskette
This is the first of DYNACOMP's educational packages. Primarily intended for pre-school to grade 5, TEACHER'S PET provides the young student with counting practice, letter-word recognition and three levels of math drill exercises.

MORSE CODE TRAINER (TRS-80 only) Price: \$11.95 Cassette/\$16.95 Diskette
MORSE CODE TRAINER is designed to develop and improve your speed and accuracy in deciphering Morse Code. As such, MCT is an ideal software package for FCC test practice. The code sound is obtained through the telephone jack of any standard cassette recorder. You may choose the pitch of the tones as well as the word rate. Also, various modes of operation are available including number, punctuation and alphabet tests, as well as the keying of your own message. A very effective way to learn code!

THOUGHT PROVOKERS

FLIGHT SIMULATOR (Available for all computers) Price: \$17.95 Cassette/\$21.95 Diskette
A realistic and extensive mathematical simulation of take-off, flight and landing. The program utilizes aerodynamic equations and the characteristics of a real airfoil. You can practice instrument approaches and navigation using radials and compass headings. The more advanced flyer can also perform loops, half-rolls and similar aerobatic maneuvers. Although this program does not employ graphics, it is exciting and very addictive. See the software review in COMPUTRONICS.

VALDEZ (Available for all computers) Price: \$15.95 Cassette/\$19.95 Diskette
VALDEZ is a computer simulation of super-tanker navigation in the Prince William Sound/Valdez Narrows region of Alaska. Included in this simulation is a realistic and extensive 256 x 256 element map, portions of which may be viewed using the ship's alphanumeric radar display. The motion of the ship itself is accurately modeled mathematically. The simulation also contains a model for the tidal patterns in the region, as well as other traffic (ougoing tankers and drifting icebergs). Chart your course from the Gulf of Alaska to Valdez Harbor! See the software review in 80 Software Critique.

NOMINOES JIGSAW (Atari, Apple and TRS-80 only) Price: \$16.95 Cassette/\$20.95 Diskette
A jigsaw puzzle on your computer! Complete the puzzle by selecting your pieces from a table consisting of 60 different shapes. NOMINOES JIGSAW is a virtuous programming effort. The graphics are superlative and the puzzle will challenge you with its three levels of difficulty. Scoring is based upon the number of guesses taken and by the difficulty of the board set-up. The NOMINOES JIGSAW is available for TRS-80 color computer.

CHESS MASTER (North Star and TRS-80 only) Price: \$19.95 Cassette/\$23.95 Diskette
This complete and very powerful program provides five levels of play. It includes castling, en passant captures and the promotion of pawns. Additionally, the board may be preset before the start of play, permitting the examination of "book" plays. To maximize execution speed, the program is written in assembly language by SOFTWARE SPECIALISTS of California. Full graphics are employed in the TRS-80 version, and two widths of alphanumeric display are provided to accommodate North Star users.

STAR TREK 3.2 (Available for all computers) Price: \$11.95 Cassette/\$15.95 Diskette
This is the classic Star Trek simulation, but with several new features. For example, the Klingons now shoot at the Enterprise without warning while also attacking starbases in other quadrants. The Klingons also attack with both light and heavy cruisers and move when shot at! The situation is hectic when the Enterprise is besieged by three heavy cruisers and a Marbase S.O.S. is received! The Klingons get even! See the software reviews in A N A L O G, 80 Software Critique and Game Merchandising.

GAMES PACK I (Available for all computers) Price: \$10.95 Cassette/\$14.95 Diskette
GAMES PACK I contains the classic computer games of BI ACK JACK, I UNAR LANDER, CRAPS, HORSE RACE, SWITCH and more. These games have been combined into one large program for ease in loading. They are individually accessed by a convenient menu. This collection is worth the price just for the DYNACOMP version of BI ACK JACK.

GAMES PACK II (Available for all computers) Price: \$10.95 Cassette/\$14.95 Diskette
GAMES PACK II includes the games CRAZY EIGHTS, JOTTO, A CLEY-DUCEY, LIFE, WULFUS and others. As with GAMES PACK I, all the games are loaded as one program and are called from a menu. You will particularly enjoy DYNACOMP's version of CRAZY EIGHTS.
Why pay \$7.95 or more per program when you can buy a DYNACOMP collection for just \$10.95?

STATISTICS and ENGINEERING

DIGITAL FILTER (Available for all computers) Price: \$29.95 Cassette/\$33.95 Diskette
DIGITAL FILTER is a comprehensive data processing program which permits the user to design his own filter function or choose from a menu of filter forms. The filter forms are subsequently converted into non-recursive convolution coefficients which permit rapid data processing. In the explicit design mode the shape of the frequency transfer function is specified by directly entering points along the desired filter curve. In the menu mode, ideal low pass, high pass and bandpass filters may be approximated to various degrees according to the number of points used in the calculation. These filters may optionally also be smoothed with a Manning function. In addition, multi-stage Butterworth filters may be selected. Features of DIGITAL FILTER include plotting of the data before and after filtering, as well as display of the chosen filter functions. Also included are convenient data storage, retrieval and editing procedures.

FOURIER ANALYZER (Available for all computers) Price: \$16.95 Cassette/\$20.95 Diskette
Use this program to examine the frequency spectra of limited duration signals. The program features automatic scaling and plotting of the input data and results. Practical applications include the analysis of complicated patterns in such fields as electronics, communications and business.

TFA (Transfer Function Analyzer) Price: \$19.95 Cassette/\$23.95 Diskette
This is a special software package which may be used to evaluate the transfer functions of systems such as hi-fi amplifiers and filters by examining their response to pulsed inputs. TFA is a major modification of FOURIER ANALYZER and contains an engineering-oriented decibel versus log-frequency plot as well as data editing features. Whereas FOURIER ANALYZER is designed for educational and scientific use, TFA is an engineering tool. Available for all computers.

HARMONIC ANALYZER (Available for all computers) Price: \$24.95 Cassette/\$28.95 Diskette
HARMONIC ANALYZER was designed for the spectrum analysis of repetitive waveforms. Features include data file generation, editing and storage (retrieval) as well as data editing features. One particularly unique facility is that the input data need not be equally spaced or in order. The original data is sorted and a cubic spline interpolation is used to create the data file required by the FFT algorithm.
FOURIER ANALYZER, TFA and HARMONIC ANALYZER may be purchased together for a combined price of \$49.95 (three cassettes and \$53.95 three diskettes).

REGRESSION I (Available for all computers) Price: \$19.95 Cassette/\$23.95 Diskette
REGRESSION I is a unique and exceptionally versatile one-dimensional least squares regression program. Features include very high accuracy, an automatic degree determination option, an extensive internal library of fitting functions, data editing, automatic data and curve plotting, a statistical analysis (eg. standard deviation, correlation coefficients, etc.) and much more. In addition, new fits may be tried without reentering the data. REGRESSION I is certainly the cornerstone program in any data analysis software library.

REGRESSION II (PARAFIT) (Available for all computers) Price: \$24.95 Cassette/\$28.95 Diskette
PARAFIT is designed to handle those cases in which the parameters are embedded (possibly nonlinearly) in the fitting function. The user simply inserts the functional form, including the parameters (A11), A12, etc.) as one or more BASIC statements lines. Data and results may be manipulated and plotted as with REGRESSION I. Use REGRESSION I for polynomial fitting, and PARAFIT for those complex functions.

MULTILINEAR REGRESSION (MLR) (Available for all computers) Price: \$24.95 Cassette/\$28.95 Diskette
MLR is a professional software package for analyzing data sets containing two or more linearly independent variables. Besides performing the basic regression calculation, this program also provides easy to use data entry, storage, retrieval and editing functions. In addition, the user may interrogate the solution by supplying values for the independent variables. The number of variables and data size is limited only by the available memory.
REGRESSION I, II and MULTILINEAR REGRESSION may be purchased together for \$49.95 (three cassettes) or \$43.95 (three diskettes).

ANOVA (Available for all computers) Price: \$39.95 Cassette/\$43.95 Diskette
In the past the ANOVA (analysis of variance) procedure has been limited to the large mainframe computers. Now DYNACOMP has brought the power of this method to small systems. For those conversant with ANOVA, the DYNACOMP software package includes the 1-way, 2-way and 3-way procedures. Also provided are the Yates 2^{k-p} fractional designs. For those unfamiliar with ANOVA, do not worry. The accompanying documentation was written in a tutorial fashion by a professor in the subject and serves as an excellent introduction to the subject. Accompanying ANOVA is a support program for building the data base. Included are several convenient features including data editing, deleting and appending.

BASIC SCIENTIFIC SUBROUTINES, Volume 1 (Not available for Atari)
DYNACOMP is the exclusive distributor for the software keyed to the popular text BASIC Scientific Subroutines, Volume 1 by F. Ruckdeschel (see the BYTE/McGraw-Hill advertisement in BYTE magazine, January 1981). These subroutines have been assembled according to chapter. Included with each collection is a menu program which selects and demonstrates each subroutine.

Collection #1 Chapters 2 and 3 Data and function plotting, complex variables
Collection #2 Chapter 4 Matrix and vector operations
Collection #3 Chapters 5 and 6 Random number generators, series approximations
Price per collection \$14.95 Cassette/\$18.95 Diskette
All three collections are available for \$39.95 (three cassettes) and \$49.95 (three diskettes)
Because the text is a vital part of the documentation, BASIC Scientific Subroutines, Volume 1 is available from DYNACOMP for \$19.95 plus the postage and handling.

ROOTS (Available for all computers) Price: \$18.95 Cassette/\$24.95 Diskette
In a nutshell, ROOTS automatically determines all the zeros of a polynomial having real coefficients. There is no limit on the degree of the polynomial, and because the procedure is iterative, the accuracy is generally very good. No initial guesses are required as input, and the calculated roots are substituted back into the polynomial and the residuals displayed.

UTILITIES

GRAFIX (TRS-80 only) Price: \$14.95 Cassette/\$18.95 Diskette
This unique program allows you to easily create graphics directly from the keyboard. You "draw" your figure using the program's extensive cursor controls. Once the figure is made, it is automatically appended to your BASIC program as a string variable. Draw a "happy face", call it HIS and then print it from your program using PRINT HIS! This is a very easy way to create and save graphics!

TIDY (TRS-80 only) Price: \$10.95 Cassette/\$14.95 Diskette
TIDY is an assembly language program which allows you to renumber the lines in your BASIC program. TIDY also removes unnecessary spaces and REMARK statements. The result is a compacted BASIC program which uses much less memory space and executes significantly faster. Once loaded, TIDY remains in memory, you may load any number of BASIC programs without having to reload TIDY!

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**TRS-80 diskettes are not supplied with DOS or BASIC. All DYNACOMP programs for TRS-80 will run on model III with the exception of TIDY, GRAPHICS, CRIBBAGE 2.0.

PERFECT NUMBERS

In one of his books, Steven Rogowski has a problem for computer solution to find abundant, deficient and perfect numbers. He defines a number as perfect if the sum of all of the factors of the number, including 1, equals the number. In fact there are very few perfect numbers, and you wouldn't want to go hunting for them without your handy-dandy computer doing all the work for you.

This program will find the first three almost instantly, and the fourth after a few minutes, but I can remember about a year ago, just out of curiosity, leaving the computer running all night to look for more of them. (You might want to turn the video display off when you do this. It has nothing to do with the operation of the computer, it just lets you see what it's up to. Then tomorrow morning just push the red Power button on the video display and see what you got.)

```

100 ' PERFECT
110 CLS
120 DEFINT N,F
130 PRINT,"PERFECT NUMBERS"
140 LET N=N+1 'GENERATES NUMBERS
150 FOR F=1 TO N/2 'FACTORS
160 IF N/F <> INT(N/F) THEN 180 'EVENLY DIVISIBLE?
170 LET S=S+F 'SUM OF THE FACTORS
180 NEXT F
190 IF S > N THEN 210 'NOT PERFECT
200 PRINT N"IS PERFECT!"
210 LET S=0 'RESET THE SUM TO ZERO
220 GOTO 140

```

ROAD RALLY

We had a great time last spring running a road rally. If you have a group of drivers in need of an activity you really should organize one. Our group was high school students and the occasion was SPRING. (It could just as easily have been a full moon.)

You print up a set of directions to give each navigator such as "turn right at the second road after the bridge", or "turn left 1.1 miles after the house with the windmill and the two wagon wheels".

I found that making up the directions was most easily done using a tape recorder in my car about a week before the rally. (Don't do it too early — some of the landmarks may change.) Record the exact time and mileage for each part of the route using posted speeds. I measured the distances and calculated the times. Where speeds were not posted we used 20 in

```

100 ' RALLY
110 DATA 4.6,675,14.4,1549,18.1,1695
120 FOR L=1 TO 3 'THREE LEGS
130 READ D(L),T(L) 'DISTANCE, TIME
140 FOR N=1 TO 2
150 INPUT "TIME (HHMMSS)";T$(N)

```

```

160 LET H(N)=VAL(LEFT$(T$(N),2)) 'HOURS
170 LET M(N)=VAL(MID$(T$(N),3,2)) 'MINUTES
180 LET S(N)=VAL(RIGHT$(T$(N),2)) 'SECONDS
190 LET SS(N)=3600*H(N) + 60*M(N) + S(N) 'TOTAL SECONDS
200 NEXT N
210 LET I(L)=SS(2)-SS(1) 'INTERVAL IN SECONDS
220 IF I(L) > 0 THEN 240
230 LET I(L)=I(L)+43200 'IN CASE OF 12:00 - 1:00
240 LET TS(L)=I(L)-T(L) 'TIME SCORE FOR EACH LEG
250 IF TS(L) > 0 THEN 270 'ONE POINT PER SECOND LATE
260 LET TS(L)=TS(L)*-2 'DOUBLE PENALTY IF EARLY
270 LET P=P+TS(L) 'TOTAL POINTS
280 NEXT L
290 INPUT "STARTING ODOMETER";O(0)
300 FOR L=1 TO 3
310 INPUT "ODOMETER (M.T)";O(L)
320 LET ME(L)=O(L)-O(L-1)-D(L) 'MILEAGE ERROR
330 LET DS(L)=ABS(ME(L))*100 'DISTANCE SCORE
340 LET P=P+DS(L) 'TOTAL POINTS
350 NEXT L
360 CLS
370 PRINT
380 PRINT,"A N A L Y S I S"
390 PRINT,,,"POINTS"
400 FOR L=1 TO 3
410 PRINT,"LEG NUMBER ";L
420 PRINT " TIME ERROR (SECONDS)=",I(L)-T(L),TS(L)
430 PRINT "DISTANCE ERROR (MILES)=",ME(L),DS(L)
440 PRINT
450 NEXT L
460 PRINT,,"TOTAL POINTS=",P;
470 INPUT "(ENTER)"; Q 'HALTS DISPLAY UNTIL (ENTER)
480 RUN

```

residential areas, 35 on gravel, 45 on paved country roads, and 55 on highways. Ten seconds extra were allowed for each stop sign, none for traffic lights.

Include two checkpoints along the course and a third when they return to the starting point. At each you will have an observer record the exact time of arrival and departure as well as the odometer reading on the car.

Scoring is done on the computer. A perfect score is zero. One hundred points are deducted for each mile an odometer is off at a check point, and one point for each second a car is late at a check point. To discourage speeding two points are deducted for each second a car is early at a check point. Cars are started at two-minute intervals, and no more than 20 cars, with two people per car should be allowed, unless you have had some experience with this sort of thing before.

As you can see from our data the total length was about 40 miles and about one hour. This worked very well for us.

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If you want your computer to **chain functions**, then you need DOSPLUS 3.3D (for example, from powerup you could have your machine call another computer, scan a data base for appointments, recording any that appear on your printer; and then load in our new BASIC, setting files and mem/size, and start your program so your secretary can go right to work). With our BUILD, DO and AUTO, all of the preceding would be child's play. By the way, you could have also set the time and date, looked at the directory of all your drives as well as checked the free space map (which tells you not only how much space you have on a diskette, but also where it is and what it is used for) DOSPLUS is a truly intelligent, easy to use operating system that gives you all your computer is capable of delivering.

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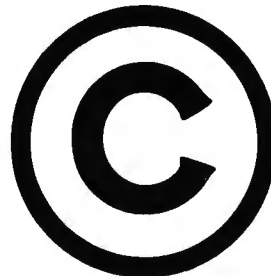
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THE SYSTEM AND PDRIVE COMMANDS OF NEWDOS80

Joseph Rosenman

When Radio Shack released its TRSDOS Disk Operating System, it was possible for the TRS-80 to access a disk (after a fashion), but that's about all. The only "configuration" choice the microcomputer users had is in how many disk drives they will purchase (1 to 4). This "bare bones" operating system permitted no customization of parameters or resources (i.e., other computer peripherals). Many Computronics readers are familiar with the NEWDOS80 operating system distributed by Apparatus. NEWDOS80 corrects many errors that TRSDOS has and adds many powerful features. Of special note are the utilities included (such as SUPERZAP and DIRCHECK). Unfortunately, the commands that permit system configuration are somewhat esoteric. In this article, I will describe how to set up the various options, and (where appropriate) explain what the options mean.

The TRS-80 uses a standard disk configuration, in which each diskette contains a number of tracks and each track contains 10 sectors. In TRSDOS, there could only be 35 tracks. NEWDOS80 allows the "track count" to be specified (more on this later). The sectors are organized into groups of five called "granules". The first granule of drive 0 track 0 must contain a special program called BOOT. BOOT contains the information the computer needs to tell it how to bring in and run the DOS. In point of fact, all the necessary information is contained in the first sector. This leaves 4 unused sectors. The original author of TRSDOS (Randy Cook) filled these sectors with a cleverly encoded "ownership" message. If you type "BOOT/SYS.WHO" and then hold down in the numbers 2 and 6 together, the screen fills with a message declaring that he owned the rights to the DOS. (Radio Shack didn't correct this until release 2.3, when it substituted TANDY CORP for RANDY COOK.) NEWDOS80 made somewhat better use of this diskette space. Sector 3 contains tables which store configuration parameters. Whenever the system is "booted up", these values are assigned to the appropriate DOS locations.

The SYSTEM Command

The SYSTEM command has 19 options (more may be added in future releases). The format of the system command is:

SYSTEM,;0

To display options.

SYSTEM,;1

To display whatever options are stored on drive 1

(they would only be used if that diskette was in drive 0 when the system was booted up).

SYSTEM,password,;0

To display options (where passwords are enabled).

SYSTEM,;0,XX=ZZ(,YY=QQ)

To set options on the diskette on drive 0 (option XX gets the value ZZ, YY gets the value QQ, etc.).

SYSTEM,password,;2,XX=ZZ

To set option XX to ZZ on drive 2 when passwords are enabled.

The actual option codes and their purposes are as follows:

- AA: Enables or Disables passwords.
- AB: Selects a "Normal" or a "Run-Only" mode.
- AC: Selects the NEWDOS80 keyboard debounce.
- AD: Enables or Disables the "JKL" screen print option.
- AE: Enables or Disables the "123" debug entry option.
- AF: Enables or Disables the "DFG" Mini-Dos option.
- AG: Determines whether BREAK will produce a 01 or a 00.
- AH: Determines the interrupt disable timing.
 - AI: Lower Case option.
 - AJ: Option to have keyboard spot "JKL", "123", & "DFG".
- AK: Option to determine whether "JKL" will dump graphics.
 - AL: Number of drives connected to the computer.
- AM: Number of tries permitted in correcting disk I/O errors.
- AN: Default drive for the DIR command.
- AO: Default drive for file save.
- AP: HIMEM address.
- AQ: Enables or Disables the CLEAR key.
- AR: Password checking during disk copy.
- AS: Allows or Prevents Lower Case in BASIC.
- AT: Undefined.

AA: If "Y", passwords are enabled, and if "N", they are disabled. This means that when passwords are enabled, the DOS will check whether or not there is a password, and if so, that it is used properly. When this option is "N", the DOS doesn't check for or care about passwords. Passwords still can be set or changed, however.

AB: If "Y", the computer will operate in "RUN-ONLY" mode. If "N", the computer is in normal mode. Essentially, Run-Only means that no "user" intervention is permitted (i.e., you can't type anything into the

keyboard from DOS READY, or issue any DIRECT commands from BASIC (a direct command would be RUN, LOAD, SAVE, etc.). If the situation arises where control passes to the user, the system "crashes" — an error message is displayed and the system waits for reset.) Don't plan to use this option on a DRIVE 0 diskette when you intend to update that diskette. This would be used where certain "authorized" individuals had permission to "use" but not to examine programs on the diskette. Obviously, placing this diskette on any drive other than drive 0 would defeat the purpose of this option.

AC: This option selects the NEWDOS80 keyboard debounce routine. In order for this option to be available, option AJ must also be set to "Y". If AC="Y" the debounce is on. If AC="N" the debounce is not used. (Key Debounce is a method of delaying the acceptance of a keystroke until a certain period has passed, in order to "filter out" spurious or unclear keystrokes. If the delay is too long (and the typist is fast) input values may disappear, and if it is too short garbage may appear.)

AD: If "Y" then "JKL" is enabled, and if "N" then "JKL" is disabled. "JKL" is the special NEWDOS80 code for dumping the contents of the video display to the line printer. If the line printer is off (or non-existent) the system will hang. By saying "JKL", what is meant is the simultaneous typing of those three keys. Warning: in some cases, some (or all) of those letters may appear as input to whatever program was executing at the time.

AE: If "Y" DEBUG mode is entered by typing "123", if "N" then DEBUG is entered via the "old" method (using the break key). As with option AD, the "123" means the simultaneous typing of those three keys.

AF: If "Y" then "DFG" is enabled, and if "N" then "DFG" is disabled. "DFG" is the special NEWDOS80 code for entering Mini-Dos. (Mini-Dos is a special "small" DOS that can be entered and exited *during* the execution of most programs on the TRS-80. This means that one could, while executing certain machine language and BASIC programs, execute most of the NEWDOS80 LIB commands, abort the current job, and even perform limited disk copies. The criterion for determining whether a machine language program can be interrupted is whether or not it uses its own keyboard routine; if so, it can't jump to Mini-Dos.)

AG: This option determines the nature of the BREAK key. If "Y", break is treated like any other input key and has the value of ASCII 01. If "N", then the BREAK key is treated as a special input (with an ASCII value of 00).

AH: This option determines when interrupts will be disabled during disk I/O operations. According to the NEWDOS80 manual, normal I/O requires 70ms, when AH="N". If AH="Y", this number is reduced to 12ms (it waits until the first byte of data is transferred). The

cost of this option is in the significantly higher "lost data" errors that will occur. If the real-time clock is being used (as in displaying the time), this time savings may be appreciable. It is my judgement, however, that it is better to keep I/O interrupts disabled at the time of the I/O request (as in the "normal" situation).

AI: If "Y", lower case has been installed; if "N", there is no lower case. At least DEBUG and SUPERZAP use this parameter to determine whether to display information in lower case.

AJ: If "Y" NEWDOS80 will intercept keyboard input into its own special internal routines, where such things as Key Debounce and special input ("JKL", "123", or "DFG") can be detected. If "N", then NEWDOS80 can't work its magic on the keyboard. Generally, you will get many more keyboard errors — without any appreciable advantages.

AK: This option determines whether the "JKL" option should alter certain ASCII codes before being dumped to the printer. If "Y", everything will be sent to the printer as it appears on the display (thus in video memory). This option should be "Y" if your printer can print TRS-80 Graphic Blocks. If "N", everything from ASCII 80H to FFH will be changed to a period, indicating that something unprintable was there. Set this to "N" if you can't print the Graphic Blocks. If you have *no* printer, make sure that option AD = "N".

AL: This option should be set to the actual number of disk drives available (1 to 4). If you set a number too high, NEWDOS80 will attempt to use it. If the number is too low, drives that really do exist will be ignored. Remember to change this option when you add a drive to your system. It just might save you the frustration of believing that your new (expensive) disk drive doesn't work when it really does.

AM: This option determines the number of tries that NEWDOS80 will make in performing disk I/O before it quits with an error message. The default value is 10. On my system, I have set this value to 4. I have found that if it doesn't work after 4 tries, it probably isn't going to. You could set this option to as many as 256 tries! (But don't, since each try will reload the read/write head; you could be waiting a very long time.)

AN: This option determines the default drive for directory listings. This means that by typing DIR with no numerical argument, the directory of whatever drive option AN is set too will be displayed. The default is for drive 0.

AO: This option determines what drive will be searched first for FDE entry space while creating a NEW file. The search proceeds in sequence (no drive number less than the value of option AO will be searched). The default is for drive 0.

AP: This option (if non-zero) will set the High Memory limit upon system BOOT.

AQ: If "Y", the CLEAR key is enabled; if "N", then it is disabled.

AR: If "Y", then passwords are not checked during diskette copies — even if passwords are enabled. If "N" then passwords are checked during copies (if passwords are enabled via option AA).

AS: If "Y", BASIC will convert any lower case input into upper case. If "N", BASIC will not perform any conversion to upper case (this option does not affect input data). If you don't have lower case, *make sure* that this option is "Y". If you have lower case, and plan to use it in BASIC, set this option to "N" and *make sure* that you load a lower case driver before entering BASIC — many nasty mistakes could occur since you would be able to perform text compares using a lower case character *without being able to see it*.

PDRIVE

The PDRIVE command is somewhat easier to use — since it only has 5 options. Because this command requires the specification of 2 drives, it is a little confusing. The proper format for the PDRIVE command is:

PDRIVE,;0;0

To see the options on drive 0, for drive 0

PDRIVE,;0;1

To see the options on drive 0, for drive 1

PDRIVE,;0;2

To see the options on drive 0, for drive 2

PDRIVE,;1;0

To see the options on drive 1, for drive 0

PDRIVE,;1;3

To see the options on drive 1, for drive 3

PDRIVE,password;0;0

To see options when passwords are enabled.

PDRIVE,;0;0,DTC=40

To set an option on drive 0 for drive 0 to: track count equals 40.

The available options are:

TI: Type of disk interface used.

TD: Type of disk drive being used.

DTC: Number of tracks on disk drive.

DDST: Disk Directory Starting Track.

DDGA: Disk Directory Granule Allocation.

TI: There are only 2 possible codes available at the present time. If TI=A, there is a standard TRS-80 interface in use. If TI=B, there is an OMIKRON 8 inch drive. (If TD=A then you must also set TI=A). Apparat also defined (but didn't implement) TI=C, which is for the LOBO expansion interface.

TD: Here also, there are only 2 possible codes available at the present time. If TD=A the disk is 5 inch, single density, single side. If TD=B the disk is 8 inch, single density, single side. Apparat also defined (but didn't implement) 6 additional disk types. They are:

C = 5 inch, single density, double sided.

D = 8 inch, single density, double sided.

E = 5 inch, double density, single side.

F = 8 inch, double density, single side.

G = 5 inch, double density, double sided.

H = 8 inch, double density, double sided.

DTC: This value determines the number of tracks on the disk. The number could range anywhere from 1 to 96. This value is used throughout NEWDOS80 (except for DIR and FREE), and it is important that it be set properly.

DDST: This is the track that will contain (or start) the DIRECTORY. Usually, it is track 17. Not all DOSs can support a directory that appears on some track other 17, so if you decide to locate the directory elsewhere, it is "at your own risk".

DDGA: This determines the number of granules to be allocated to a diskette directory (between 2 to 6). If additional granules are allocated, they will appear on the tracks immediately following the track specified in DDST. The usual number of granules is 2. If you had many single granule files, you might want to add a granule to the directory (you should only do this to a "clean" diskette, in order to make sure that the track following the directory has not allready been allocated). 80-track diskettes will often have a 4 granule directory.

EXAMPLES

Now for some examples. We have been living with a one drive system and just won a lottery! We decided to expand our system by adding a 40 track drive and an 80 track drive. Furthermore, we will always use drive 0 as a "SYSTEM" drive, and use drives 1 and 2 as "DATA" drives. We would need to update both the system command and the PDRIVE command to reflect this change. So, with a NEWDOS80 diskette in drive 0 we would type:

SYSTEM,;0,AL=3

<Now we have 3 drives>

PDRIVE,;0;1,DTC=40

<Drive 1 is 40 tracks>

PDRIVE,;0;2,DTC=80,

<Drive 2 is 80 tracks, and has

DDGA=4

a 2 track DIRECTORY>

For users with only one standard 35 track Radio Shack drive:

PDRIVE,;0;0,DTC=35

<Drive 0 is 35 tracks>

SYSTEM,;0,AL=1

<Only 1 drive available>

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Has things that other programs should have, but don't. Upper and lower case output to your printer (if your printer accepts lower case) without having your computer modified ON UPPER CASE ONLY MACHINES This program marks the capital letters so you can see which letters are CAPITALS and which are not / Will change all upper characters text to lower case or all lower case to upper. A SINGLE COMMAND / Will capitalize the first letter of all sentences and all proper noun I's, WITH A SINGLE COMMAND / LOADS ANY ELECTRIC PENCIL FILE / ASCII SAVED FILES EDTASM FILES or BASIC PROGRAMS SAVED ASCII / Permits installing special control characters in your text for your printers special features, like double wide or condensed print / Definable screen length and definable print length to 255 characters wide / Screen editing that is not final till your command. This means that you can edit your file on the screen and if you don't like how it reads you can cancel and leave it the way it was / You can append files (which means that you can put one file to the end of another file) / No lost characters at the end of the line, even for the fastest typist / A directory of all your files is available to the user without leaving the program / Saving programs to disk easy enough for the non-computer user / To save memory, not all the program modules are in memory at one time but are called from the disk as needed / You can set tab positions like on a typewriter / 10 CUSTOM COMMAND KEYS for the experienced user there is a command file that permits many special functions that are all user defined (not enough space for better explanation in ad, send for complete overview) / Program has HELP file that is a short review of the commands that are available /

Standard Printer Module. This printer module is provided for the user as a standard feature. Optional special printer routines for custom printer will be available in the near future. In this original release, it has the following printer drivers and will support the following printing devices: RS232, TRS232 and PARALLEL printer ports. You have the following format commands: Justifies Text, Centers Text, Centers Title, Line Spacing, Line Length from 3-255 characters and Set Margins / Also send any ASCII code to any printer from the text / Save formatted text to the disk for spooling later / Information for customer to load his own special printer driver / Printing can be stopped and started by the user at any time and then restarted where you left off / You can print entire file or just print to bottom of the page /

Communication Package. RS232 COMMUNICATION TERMINAL PROGRAM permits you to communicate with other computers. Transfer files from one machine to another. Permits dumping memory across the phone lines. Receive files from other TRS-80's and "Shake Hands" with larger computers. This is the complete system called LAZY WRITER. There is no package written for the TRS-80* that is as comprehensive. This package is available for the TRS-80* MOD I, 32K or larger with at least a single disk drive. List price is from

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A key that remembers the cursor position.

User definable special character. For use with printers that have printable characters that the TRS-80 keyboard does not normally support

Margin control from within text. This means that you can change the margins of your printed text without stopping the printer routine and changing it

Page offset with odd/even headers & footers. This means that you can print one page offset to the left of center and the next page offset to the right. This is very nice when you are writing a book

Printing chaining feature. This permits having more than one file on disk and create one printed letter, contract, or book without having to reset the printer commands

Mandatory space command. This is necessary when you are writing letters or papers that have certain words that are not to be broken-up. eg. John P. Andhouser. This name can be made to be unbreakable to justify routines in the program

Disk catalog. Now you can load your disk directory into memory and create a file of this information

Reverse indents or known as Hanging Indents

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If the configuration has lower case, then type:

SYSTEM,;0,AL=1,AI=N <1 drive and lower case available>

For users with 2 drives (0=35 tracks,1=40 tracks), lower case, and an EPSON MX-80 printer (which can print screen graphic blocks):

PDRIVE,;0,;0,DTC=35 <Drive 0 is 35 tracks>
PDRIVE,;0,;1,DTC=40
<Drive 1 is 40 tracks>
SYSTEM,;0,AL=2,AK=Y, AI=Y <2 drives, graphics, lower case>

For users with 4 Radio Shack Drives and a Radio Shack line printer (no graphics):

PDRIVE,;0,;0,DTC=35 <Drive 0 is 35 tracks>
PDRIVE,;0,;1,DTC=35 <Drive 1 is 35 tracks>
PDRIVE,;0,;2,DTC=35 <Drive 2 is 35 tracks>
PDRIVE,;0,;3,DTC=35 <Drive 3 is 35 tracks>
SYSTEM,;0,AL=4,AK=N <4 drives, no graphic print>

For our last example:
4 40-track drives
lower case
graphic blocks on the printer
no passwords required
use NEWDOS80's keyboard debounce
enable "JKL", "123", and "DFG",
have keyboard spot "JKL", "123", and "DFG",
permit only 4 I/O tries before command aborts,
change the DIRectory search default from drive
0 to 1,
bypass password checking during disk copy,
permit lower case in BASIC programs.

PDRIVE,;0,;0,DTC=40 <Drive 0 is 40 tracks>
PDRIVE,;0,;1,DTC=40 <Drive 1 is 40 tracks>
PDRIVE,;0,;2,DTC=40 <Drive 2 is 40 tracks>
PDRIVE,;0,;3,DTC=40 <Drive 3 is 40 tracks>
SYSTEM,;0,AL=4,AI=Y,AK=Y,AA=N,AC=Y,AD=Y,
AE=Y,AF=Y,AJ=Y,AM=4, AN=1,AR=Y,AS=N

In all cases, the directories begin on track 17. After we re-BOOT the system, these new options will be in effect. One final word: both SYSTEM and PDRIVE will list all of their options when the commands are executed. If any changes have been made, they will be reflected in the list displayed. If no changes were made, then the list will just display the current defaults.

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machine language programs from cassette.

CLOSE: This command "closes" a "device path" created by OPEN (see OPEN for more details).

CLS: This command can be followed by a number between 0-8, and will clear the screen to the color represented by that number. The number can be a variable within parentheses: CLS(I).

EOF: This is a function that determines whether or not the End Of File has been reached.

EXEC: This command transfers execution to the machine language program that begins at the address specified in the EXEC command. If no address is specified, the address set by the last CLOADM is used.

JOYSTK: This function will return the value of the horizontal and vertical positions of the joysticks. There are 4 subscripts (0-3). Both the right and left joysticks are accessed through this function.

MOTOR: You can turn the cassette motor ON or OFF with this command (Why?).

OPEN: This command creates an explicit pathway for I/O operations. For instance, "O";#-1,"TEXT" would set up output to the cassette (device # 1), and the file would be named "TEXT".

SET: This command allows the "Setting" of a portion of a graphic block (each block has 4 quarters). There is an X,Y specification required, and an optional third specification for color.

SKIPF: This command causes the cassette to skip ahead to the end of the current program, or to the end of a program you specify.

In the next issue of **Computronics**, I will review the Extended Basic version of the Color Computer, and in the November issue, I will review several programs (from both Radio Shack and others) for the Color Computer. ■

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problem that arises at this time: YOU CANNOT USE CHR\$(0) WITH THE TRS-80. This is a null and the computer will not do anything with it. This applies to the text mode as well as the graphics mode. If you need to use this character, you must poke a zero into memory location 14312 (for LEVEL II 16K systems).

Now for the only really serious deficiency (in my opinion) that I found. The operation manual is very poor in explaining the graphics mode. It provides a barely adequate explanation of the makeup of the code. It does not explain about the possible problem in using a null. The pictures are nice in that they show what can be done; but there are no examples to help you to understand how to apply the graphics mode.

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In general though, if you can get the graphics figured out, you will have a lot of fun with some very nice high resolution graphics. You can make some nice pictures and great graphs. Two things that you will have to remember is to set your line spacing at 8/72 inch and to poke your zeros rather than use CHR\$(0).

A few other specifications that may be of interest are:

- 80 characters per second printing speed,
- unidirectional printing,
- tractor feed is adjustable from 4 inches to 10 inches,
- capable of printing an original and two carbons,
- prints 10 characters per inch,
- quieter operation than Centronics printers,
- all motors are stepper motors that only run when needed.

After getting to know my MX-70, I find it hard to understand how Epson can sell such a package of features at such a low price. This printer would be a bargain at \$550.00. It meets so many of the home computerist's printing needs so well that I can hardly believe it. The problems I encountered were not insurmountable: the need for an extra +5 vdc, the inability to use CHR\$(0), and the poor documentation for the graphics. This little printer is truly a versatile

printing tool with plotter quality graphics on the side — a fine basic-PLUS printer for home and limited business use.

Brett A. McAlister
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Model II. The Model II still employs up to four 8-inch disks, which have a storage capacity of about 500K bytes each; but a double-sided double-density Model III disk will store about 400K. The next major difference between the two machines is likely to be that Radio Shack will introduce a hard disk for the Model II, but if RS doesn't make it available for the Model III, we are sure that someone else will, perhaps Lifeboat again. The Model III certainly ought to be considered seriously for small business applications. ■

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VOL. 4 - DISASSEMBLED HANDBOOK FOR TRS-80

Robert M. Richardson

CHAPTER 6

W4UCH BAUDOT RADIO TELETYPE RECEIVE PROGRAM

60, 66, 75 AND 100 WORDS PER MINUTE SPEED

INTRODUCTION

Receiving Baudot radio teletype with a stable amateur single sideband receiver, converting the 2125 cycle MARK tones and 2295 cycle SPACE tones to TTL logic levels with a Flesher TU-170 terminal unit, and then applying them to the TRS-80's I/O bus with a Telesis VAR/80 interface unit is certainly just as easy, if not more so, than generating a Baudot radio teletype signal which was covered in the last Chapter.

Since we will not be generating prepared messages as we did in Chapter 5, the total Baudot receive program is only about 1/2 the length of the Baudot transmit program.

Same as the last Chapter, the RS-232C adaptor will NOT be required as the program creates its own software UART for converting the incoming serial data stream to parallel. The program as written will work "fine business" on both the Model I and Model III TRS-80s. Again, see APPENDIX 2 for wiring up the necessary Model III to Model I adaptor for the I/O bus, though there should be numerous low cost ready-made adaptors on the market by the time this is published.

SPACE AND FREQUENCY DIVERSITY RECEIVING SYSTEMS

Except for line of sight and forward scatter communications, most long distance radio communications utilize the F2 layer in the upper ionosphere to propagate the radio signal from one point to another by bending it around the earth's curvature. The level of ionization and the resulting MUF (maximum useable frequency) that ?????????? the highest frequency that will be reflected at a given time is determined primarily by radiation from the sun; i.e., the MUF decreases significantly at night and increases during daylight hours, usually peaking around local noon time. On a short term basis (micro/milli-seconds), scintillation, a brief variation in the ionizing level often occurs, causing momentary fading.

Experts are asked to take this simplistic explanation with a grain of salt, but for all intents this is what happens.

A number of long distance commercial (and military) radio communication systems utilize both space and frequency diversity to eliminate short term fading due

to temporary fluctuations in the F2 layer. Space diversity is accomplished by spacing a number of antennas 10 to 20 or more wave lengths apart. Frequency diversity is accomplished by transmitting exactly the SAME information on another frequency channel to minimize short term fading.

Here is an interesting aspect regarding the frequency diversity reception of amateur FSK (frequency shift keyed) radio teletype signals, as most amateurs DO NOT have the capability or real estate to set up the space diversity approach to minimize short term fading:

1. The majority of radio teletype terminal units utilize ONLY the mark OR the space tone to determine whether a mark or space was received; i.e., if the audio 2125 cycle tone is present, it is a mark. IF the audio 2125 cycle tone is NOT present, it is a space. Or the following (not both):

2. Conversely, if a 2295 cycle is present it is a space. If it is absent, it is a mark.

Now, here is the concept of using either hardware (or software) to create a frequency diversity radio teletype receiving system THAT WILL AUTOMATICALLY select either #1 or #2 above, WHICHEVER WAS VALID AT THE TIME OF THE OTHER FREQUENCY'S SHORT TERM FADE. IT IS NOT PERFECT, BUT A GIANT IMPROVEMENT OVER DECODING "ONLY" MARK OR SPACE, ALONE.

This unique concept was developed by John Loughmiller-KB9AT, and first published in "Ham Radio" magazine in the October '78 issue, pages 74-77. We highly recommend any serious radio teletype buff's reading it as it is one of the best and most fascinating approaches to solving the F2 layer scintillation problem when space diversity is not possible.

Please understand that there is a great deal more to a radio teletype (TU) terminal unit than just a simple mark or space decoder and that some other *important factors* include:

1. Limiter dynamic range, IF a limiter is used.
2. Dynamic range, IF a limiter is NOT used.
3. Passband shape factor - NOT decoding undesired signals.
4. Stability - will the audio tone decoder drift due to temperature or voltage fluctuations.

APPENDIX 3 details the author's modification to

KB9AT's excellent circuit using National Semiconductor TTL chips since a number of the TTL chips that John Loughmiller specified are no longer available from Fairchild Semiconductor.

EDITOR'S NOTE

We recommend you "NEVER USE" use Fairchild Semiconductor TTL devices as they APPEAR and DISAPPEAR with greater regularity than the "Witch of the North." Here today, gone tomorrow. Not even a "broomstick" remains to let you know they ever existed.

BAUDOT RECEIVE PROGRAM LOGIC AND FLOW

In essence, the program is little more than a software UART (universal asynchronous receiver-transmitter) that converts the serial Baudot data stream into a parallel word whose decimal value is equal to the Baudot character received. MEM is used to recall whether the character is from LETTERS or FIGURES. A compare table then matches the decimal value of the Baudot character received up with its appropriate alphanumeric/punctuation counterpart and jumps off to load it with its ASCII value which is then displayed on video, AND if you have a line printer turned "on" also printed out.

IT SURE SOUNDS SIMPLE TO ME, BUT I'M GONNA FASTEN MY SEATBELT!

Gridley, you have got to be the world's most suspicious student. Whatever made you like that?

EXPERIENCE AND 4 VOLUMES FROM YOU !!!

Very well Gridley, even though the comments are largely self-explanatory, let's run through most of the program's lines to make sure we have not inadvertently obscured some important point for you.

Lines 160-310: Initialize the program and remind us we are in the RECEIVE MODE.

WHY DOESN'T THIS LINE TELL US WHAT OUR TELETYPE SPEED IS ? ? ?

Good question, Gridley. We could have used the same routine as we did in the last Chapter; i.e., TRANSMIT MODE - WPM = 60 or whatever speed you selected, BUT we figured you had the intelligence to remember since it is announced EVERY TIME you switch to TRANSMIT MODE. Seriously, you WOULD NOT want to see the transmit speed repeated since we have included the feature of allowing you to select a DIFFERENT receive speed, if desired. Anytime a signal is BEING RECEIVED and printed out on video, the program lines 3700 - 3720 check to see if the BREAK key is pressed. IF SO, the program asks YOU to input TIME1 and TIME2, thus allowing YOU to set the receive speed. As such, in the next Chapter you may transmit at one speed and receive at another, if you wish.

Lines 320-360: First introduce a 1/2 second time delay to keep the program from jumping back to the

transmit mode (next Chapter) since the CLEAR key is used to switch back and forth between both transmit and receive modes (lines 340-360). In line 360 we have substituted JP Z,SPEED for JP Z,XMIT in the next Chapter.

Lines 370-440: Are a sort of "synchronize" GO scheme. What they are looking for in essence is 2+ mark periods in a row before continuing on to START. Though not perfect, they work quite well when coming to receive mode from transmit mode.

```

00100 ; - W4UCH BAUDOT TELETYPE RECEIVE PROGRAM -
00110 ;
00120 ; 60, 66, 75, AND 100 WORDS PER MINUTE EQUIVALENT SPEED
00130 ;
00140 ; COPYRIGHT 1981 (C) OBJECT = BAUDOT3 & SOURCE = BAUDOT4
00150 ;
00160 W4UCH EQU 31000 ;=7918H FOR YOU PURISTS
00170 ORG W4UCH ;LET'S START HERE
00180 EX AF,AF' ;SWAP ALTERNATE REGISTERS
00190 EXX ;SWAP ALTERNATE REGISTERS
00200 PUSH IX ;SAVE IN STACK
00210 PUSH IY ;SAVE IN STACK
00220 DI ;DISABLE INTERRUPTS
00230 CALL CLS ;COMPATABILITY MOD 1 & 3
00240 MODE CALL CARRET ;VIDEO CARRIAGE RETURN
00250 LC HL,REC'V ;RECEIVE MESSAGE ADDRESS
00260 CALL 28A7H ;DISPLAY STRING ROUTINE
00270 ;LATER USE NEXT CHAPTER
00280 CALL CARRET ;VIDEO CARRIAGE RETURN
00290 JP RGO ;JUMP AROUND MESSAGE
00300 RECV DEF'FM 'RECEIVE MODE'
00310 DEF'3 0 ;MESSAGE DELIMITER
00320 RGO LD BC,32000 ;1/2 SECOND TIME DELAY
00330 CALL 060H ;DO IT
00340 LD A,(14400) ;CLEAR KEY ROW IN MEM
00350 CP 2 ;CLEAR KEY PRESSED ?
00360 JP Z,SPEED ;GOTO XMIT - NEXT CHAPTER
00370 IN A,(0) ;127 = SPACE & 255 = MARK
00380 CP 127 ;SPACE SIGNAL PRESENT ?
00390 JP Z,RGO ;IF SO, GO LOOK AGAIN
00400 LD BC,(TIME3) ;BIT LENGTH + 100
00410 CALL 060H ;ROM TIME DELAY ROUTINE
00420 IN A,(0) ;LOAD 'A' PORT ZERO
00430 CP 127 ;SPACE SIGNAL THERE ?
00440 JP Z,RGO ;IF SO, GO LOOK AGAIN
00450 START LD A,(14400) ;CLEAR KEY ROW IN MEM
00460 CP 2 ;CLEAR KEY PRESSED ?
00470 JP Z,SPEED ;GOTO XMIT - NEXT CHAPTER
00480 IN A,(0) ;LOAD 'A' PORT ZERO
00490 CP 127 ;IS THE START BIT THERE ?
00500 JP NZ,START ;IF NOT, GO LOOK AGAIN
00510 LD D,0 ;ZERO OUT CHAR COUNTER
00520 LD BC,(TIME2) ;1/2 BIT LENGTH VALUE
00530 CALL 060H ;TIME DELAY SUBROUTINE
00540 BIT0 LD BC,(TIME1) ;FULL BIT LENGTH VALUE
00550 CALL 060H ;TIME DELAY SUBROUTINE
00560 IN A,(0) ;LOAD 'A' PORT ZERO
00570 CP 127 ;127 = SPACE BIT
00580 JP NZ,SET0 ;IF MARK, GO SET BIT 0
00590 SET 0,A ;EQUALIZING -

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00600	JP	BIT1	;TIME DELAY	01220	DEFB	0	;MESSAGE DELIMITER
00610	LD	BC,(TIME1)	;FULL BIT LENGTH VALUE	01230	CALL	1BB3H	;KYBD/VIDEO INPUT ROUTINE
00620	CALL	060H	;TIME DELAY SUBROUTINE	01240	RST	10H	;SCAN STRING SET 'C' FLAG
00630	IN	A,(0)	;LOAD 'A' PORT ZERO	01250	CALL	0E6CH	;ASCII \$ TO ACUM RET MIN
00640	CP	127	;127 = SPACE BIT	01260	CALL	0A7FH	;CONVERT ACCUM TO INTEGER
00650	JP	NZ,SET1	;IF MARK, GO SET BIT 1	01270	LD	(TIME2),HL	;STASH IT AWAY IN TIME 2
00660	SET	0,A	;EQUALIZING -	01280	JP	RG0	;START ALL OVER AGAIN
00670	JP	BIT2	;TIME DELAY	01290	LD	A,(SHIFT)	;LTRS = 0 & FIGS = 1
00680	LD	BC,(TIME1)	;FULL BIT LENGTH VAULE	01300	CP	0	;SUBTRACT 0 SET 'Z' FLAG
00690	CALL	060H	;TIME DELAY SUBROUTINE	01310	JP	NZ,FIGS2A	;IF NOT ZERO, GOTO FIGS2
00700	IN	A,(0)	;LOAD 'A' PORT ZERO	01320	POP	AF	;LOAD 'A' FORMER 'D'
00710	CP	127	;127 = SPACE BIT	01330	CP	1	;LETTERS 1 = E
00720	JP	NZ,SET2	;IF MARK, GO SET BIT 2	01340	JP	Z,EE	;IF SO, GOTO EE
00730	SET	0,A	;EQUALIZING -	01350	CP	2	;LETTERS 2 = LINE FEED
00740	JP	BIT3	;TIME DELAY	01360	JP	Z,START	;IF SO, IGNORE IT
00750	LD	BC,(TIME1)	;FULL BIT LENGTH VALUE	01370	CP	3	;LETTERS 3 = A
00760	CALL	060H	;TIME DELAY SUBROUTINE	01380	JP	Z,AA	;IF SO, GOTO AA
00770	IN	A,(0)	;LOAD 'A' PORT ZERO	01390	CP	4	;LETTERS 4 = SPACE
00780	CP	127	;127 = SPACE BIT	01400	JP	Z,SPACEA	;IF SO, GOTO SPACE
00790	JP	NZ,SET3	;IF MARK, GOT SET BIT 3	01410	CP	5	;LETTERS 5 = S
00800	SET	0,A	;EQUALIZING -	01420	JP	Z,SS	;IF SO, GOTO SS
00810	JP	BIT4	;TIME DELAY	01430	CP	6	;LETTERS 6 = I
00820	LD	BC,(TIME1)	;FULL BIT LENGTH VALUE	01440	JP	Z,II	;IF SO, GOTO II
00830	CALL	060H	;TIME DELAY SUBROUTINE	01450	CP	7	;LETTERS 7 = U
00840	IN	A,(0)	;LOAD 'A' PORT ZERO	01460	JP	Z,UU	;IF SO, GOTO UU
00850	CP	127	;127 = SPACE BIT	01470	CP	8	;LETTERS 8=CARRIAGE RETN
00860	JP	NZ,SET4	;IF MARK, GO SET BIT 4	01480	JP	Z,CARRTN	;PRINTER CARRIAGE RETURN
00870	SET	0,A	;EQUALIZING -	01490	CP	9	;LETTERS 9 = D
00880	JP	LOAD	;TIME DELAY	01500	JP	Z,DD	;IF SO, GOTO DD
00890	LD	BC,(TIME1)	;FULL BIT LENGTH VALUE	01510	CP	10	;LETTERS 10 = R
00900	CALL	060H	;TIME DELAY SUBROUTINE	01520	JP	Z,RR	;IF SO, GOTO RR
00910	PUSH	DE	;DE REG ON TOP OF STACK	01530	CP	11	;LETTERS 11 = J
00920	JP	LTRS	;GOTO LTRS	01540	JP	Z,JJ	;IF SO, GOTO JJ
00930	SET	0,D	;SET BIT ZERO TO ONE	01550	CP	12	;LETTERS 12 = N
00940	JP	BIT1	;GOTO BIT 1	01560	JP	Z,NN	;IF SO, GOTO NN
00950	SET	1,D	;SET BIT ONE TO ONE	01570	CP	13	;LETTERS 13 = F
00960	JP	BIT2	;GOTO BIT 2	01580	JP	Z,FF	;IF SO, GOTO FF
00970	SET	2,D	;SET BIT TWO TO ONE	01590	CP	14	;LETTERS 14 = C
00980	JP	BIT3	;GOTO BIT 3	01600	JP	Z,CC	;IF SO, GOTO CC
00990	SET	3,D	;SET BIT THREE TO ONE	01610	CP	15	;LETTERS 15 = K
01000	JP	BIT4	;GOTO BIT 4	01620	JP	Z,KK	;IF SO, GOTO KK
01010	SET	4,D	;SET BIT 4 TO ONE	01630	CP	16	;LETTERS 16 = T
01020	JP	LOAD	;GOTO LOAD	01640	JP	Z,TT	;IF SO, GOTO TT
01030	LD	HL,SPD1A	;MESSAGE ADDRESS TO HL	01650	CP	17	;LETTERS 17 = Z
01040	CALL	28A7H	;DISPLAY MESSAGE ROUTINE	01660	JP	Z,ZZ	;IF SO, GOTO ZZ
01050	LD	BC,65500	;APPROXIMATELY 1 SECOND -	01670	CP	18	;LETTERS 18 = L
01060	CALL	060H	;TIME DELAY	01680	JP	Z,LL	;IF SO, GOTO LL
01070	JP	SPD2A	;JUMP AROUND MESSAGE -	01690	CP	19	;LETTERS 19 = W
01080	DEFM	'INPUT TIME 1'	;IS GOOD PRACTICE	01700	JP	Z,WW	;IF SO, GOTO WW
01090	DEFB	0	;MESSAGE DELIMITER	01710	CP	20	;LETTERS 20 = H
01100	CALL	1BB3H	;KYBD/VIDEO INPUT ROUTINE	01720	JP	Z,HH	;IF SO, GOTO HH
01110	RST	10H	;SCAN \$ SET 'C' FLAG	01730	CP	21	;LETTERS 21 = Y
01120	CALL	0E6CH	;ASCII\$ TO ACCUM RET MIN	01740	JP	Z,YY	;IF SO, GOTO YY
01130	CALL	0A7FH	;CONV ACCUM TO INTEGER	01750	CP	22	;LETTERS 22 = P
01140	LD	(TIME1),HL	;STASH IT AWAY IN TIME 1	01760	JP	Z,PP	;IF SO, GOTO PP
01150	LD	DE,100	;100 DECIMAL TO DE	01770	CP	23	;LETTERS 23 = Q
01160	ADD	HL,DE	;ADD 100 TO TIME 1	01780	JP	Z,QQ	;IF SO, GOTO QQ
01170	LD	(TIME3),HL	;STASH IT AWAY IN TIME 3	01790	CP	24	;LETTERS 24 = 0
01180	LD	HL,SPD3A	;TIME 2 MESSAGE ADDRESS	01800	JP	Z,00	;IF SO, GOTO 00
01190	CALL	28A7H	;DISPLAY MESSAGE ROUTINE	01810	CP	25	;LETTERS 25 = B
01200	JP	SPD4A	;JUMP AROUND MESSAGE -	01820	JP	Z,BB	;IF SO, GOTO BB
01210	DEFM	'INPUT TIME 2'	;FOR SAFETY'S SAKE				

01830	CP	26	; LETTERS 26 = G	02440	CP	25	; FIGURES 25 = ?
01840	JP	Z,GG	; IF SO, GOTO GG	02450	JP	Z,QUEST	; IF SO, GOTO QUEST
01850	CP	27	; LETTERS 27 = FIGURES	02460	CP	26	; FIGURES 26 = AMPERSAND
01860	JP	Z,FIGS1A	; IF SO, GOTO FIGS 1	02470	JP	Z,AND	; IF SO, GOTO AND
01870	CP	28	; LETTERS 28 = M	02480	CP	27	; FIGURES 27 = FIGURES
01880	JP	Z,MM	; IF SO, GOTO MM	02490	JP	Z,START	; IGNORE, AS ALREADY THERE
01890	CP	29	; LETTERS 29 = X	02500	CP	28	; FIGURES 28 = PERIOD
01900	JP	Z,XX	; IF SO, GOTO XX	02510	JP	Z,PERIOD	; IF SO, GOTO PERIOD
01910	CP	30	; LETTERS 30 = V	02520	CP	29	; FIGURES 29 = /
01920	JP	Z,VV	; IF SO, GOTO VV	02530	JP	Z,SLASH	; IF SO, GOTO SLASH
01930	JP	START	; IF ERROR, GOTO START	02540	CP	30	; FIGURES 30 = ;
01940	FIGS1A	LD	A,1	02550	JP	Z,SEMIC	; IF SO, GOTO SEMIC
01950	LD	(SHIFT),A	; STASH IT AWAY IN SHIFT	02560	CP	31	; FIGURES 31 = LETTERS
01960	JP	START	; START ALL OVER AGAIN	02570	JP	Z,UNSHIF	; IF SO, GOTO UNSHIFT
01970	FIGS2A	POP	AF	02580	JP	START	; IF ERROR, GOTO START
01980	CP	1	; FIGURES 1 = 3	02590	SPACEA	LD	A,0
01990	JP	Z,THREE	; IF SO, GOTO THREE	02600	LD	(SHIFT),A	; ON SPACE: 0 = LETTERS
02000	CP	2	; FIGURES 2 = LINE FEED	02610	LD	A,' '	; SPACE
02010	JP	Z,START	; IF SO, IGNORE IT	02620	JP	SHOW	; GOTO SHOW
02020	CP	3	; FIGURES 3 = -	02630	AA	LD	A,'A'
02030	JP	Z,DASH	; IF SO, GOTO DASH	02640	JP	SHOW	; GOTO SHOW
02040	CP	4	; FIGURES 4 = SPACE	02650	BB	LD	A,'B'
02050	JP	Z,SPACEA	; IF SO, GOTO SPACE	02660	JP	SHOW	; GOTO SHOW
02060	CP	6	; FIGURES 6 = 8	02670	CC	LD	A,'C'
02070	JP	Z,EIGHT	; IF SO, GOTO EIGHT	02680	JP	SHOW	; GOTO SHOW
02080	CP	7	; FIGURES 7 = 7	02690	DD	LD	A,'D'
02090	JP	Z,SEVEN	; IF SO, GOTO SEVEN	02700	JP	SHOW	; GOTO SHOW
02100	CP	8	; FIGURES 8 = CARR. RETURN	02710	EE	LD	A,'E'
02110	JP	Z,CARRTN	; PRINTER CARRIAGE RETURN	02720	JP	SHOW	; GOTO SHOW
02120	CP	9	; FIGURES 9 = \$	02730	FF	LD	A,'F'
02130	JP	Z,DOLLAR	; IF SO, GOTO DOLLAR	02740	JP	SHOW	; GOTO SHOW
02140	CP	10	; FIGURE 10 = 4	02750	GG	LD	A,'G'
02150	JP	Z,FOUR	; IF SO, GOTO FOUR	02760	JP	SHOW	; GOTO SHOW
02160	CP	11	; FIGURES 11 = APOSTROPHE	02770	HH	LD	A,'H'
02170	JP	Z,APOST	; IF SO, GOTO APOST	02780	JP	SHOW	; GOTO SHOW
02180	CP	12	; FIGURES 12 = COMMA	02790	II	LD	A,'I'
02190	JP	Z,COMMA	; IF SO, GOTO COMMA	02800	JP	SHOW	; GOTO SHOW
02200	CP	13	; FIGURES 13 = !	02810	JJ	LD	A,'J'
02210	JP	Z,EXCLAM	; IF SO, GOTO EXCLAM	02820	JP	SHOW	; GOTO SHOW
02220	CP	14	; FIGURES 14 = :	02830	KK	LD	A,'K'
02230	JP	Z,COLON	; IF SO, GOTO COLON	02840	JP	SHOW	; GOTO SHOW
02240	CP	15	; FIGURES 15 = (02850	LL	LD	A,'L'
02250	JP	Z,CLOSE	; IF SO, GOTO CLOSE	02860	JP	SHOW	; GOTO SHOW
02260	CP	16	; FIGURES 16 = 5	02870	MM	LD	A,'M'
02270	JP	Z,FIVE	; IF SO, GOTO FIVE	02880	JP	SHOW	; GOTO SHOW
02280	CP	17	; FIGURES 17 = "	02890	NN	LD	A,'N'
02290	JP	Z,QUOTE	; IF SO, GOTO QUOTE	02900	JP	SHOW	; GOTO SHOW
02300	CP	18	; FIGURES 18 =)	02910	OO	LD	A,'O'
02310	JP	Z,OPEN	; IF SO, GOTO OPEN	02920	JP	SHOW	; GOTO SHOW
02320	CP	19	; FIGURES 19 = 2	02930	PP	LD	A,'P'
02330	JP	Z,TWO	; IF SO, GOTO TWO	02940	JP	SHOW	; GOTO SHOW
02340	CP	20	; FIGURES 20 = #	02950	QQ	LD	A,'Q'
02350	JP	Z,NUMBER	; IF SO, GOTO NUMBER	02960	JP	SHOW	; GOTO SHOW
02360	CP	21	; FIGURES 21 = 6	02970	RR	LD	A,'R'
02370	JP	Z,SIX	; IF SO, GOTO SIX	02980	JP	SHOW	; GOTO SHOW
02380	CP	22	; FIGURES 22 = ZERO	02990	SS	LD	A,'S'
02390	JP	Z,ZERO	; IF SO, GOTO ZERO	03000	JP	SHOW	; GOTO SHOW
02400	CP	23	; FIGURES 23 = 1	03010	TT	LD	A,'T'
02410	JP	Z,ONE	; IF SO, GOTO ONE	03020	JP	SHOW	; GOTO SHOW
02420	CP	24	; FIGURE 24 = 9	03030	UU	LD	A,'U'
02430	JP	Z,NINE	; IF SO, GOTO NINE	03040	JP	SHQW	; GOTO SHOW

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03050 VV LD A, 'V'
03060 JP SHOW ;GOTO SHOW
03070 WW LD A, 'W'
03080 JP SHOW ;GOTO SHOW
03090 XX LD A, 'X'
03100 JP SHOW ;GOTO SHOW
03110 YY LD A, 'Y'
03120 JP SHOW ;GOTO SHOW
03130 ZZ LD A, 'Z'
03140 JP SHOW ;GOTO SHOW
03150 ONE LD A, '1'
03160 JP SHOW ;GOTO SHOW
03170 TWO LD A, '2'
03180 JP SHOW ;GOTO SHOW
03190 THREE LD A, '3'
03200 JP SHOW ;GOTO SHOW
03210 FOUR LD A, '4'
03220 JP SHOW ;GOTO SHOW
03230 FIVE LD A, '5'
03240 JP SHOW ;GOTO SHOW
03250 SIX LD A, '6'
03260 JP SHOW ;GOTO SHOW
03270 SEVEN LD A, '7'
03280 JP SHOW ;GOTO SHOW
03290 EIGHT LD A, '8'
03300 JP SHOW ;GOTO SHOW
03310 NINE LD A, '9'
03320 JP SHOW ;GOTO SHOW
03330 ZERO LD A, '0'
03340 JP SHOW ;GOTO SHOW
03350 DASH LD A, '-'
03360 JP SHOW ;GOTO SHOW
03370 DOLLAR LD A, '$'
03380 JP SHOW ;GOTO SHOW
03390 APOST LD A, ''
03400 JP SHOW ;GOTO SHOW
03410 COMMA LD A, ','
03420 JP SHOW ;GOTO SHOW
03430 EXCLAM LD A, '!'
03440 JP SHOW ;GOTO SHOW
03450 COLON LD A, ':'
03460 JP SHOW ;GOTO SHOW
03470 OPEN LD A, '('
03480 JP SHOW ;GOTO SHOW
03490 QUOTE LD A, '"'
03500 JP SHOW ;GOTO SHOW
03510 CLOSE LD A, ')'
03520 JP SHOW ;GOTO SHOW
03530 NUMBER LD A, '#'
03540 JP SHOW ;GOTO SHOW
03550 QUEST LD A, '?'
03560 JP SHOW ;GOTO SHOW
03570 AND LD A, '&'
03580 JP SHOW ;GOTO SHOW
03590 PERIOD LD A, '.'
03600 JP SHOW ;GOTO SHOW
03610 SLASH LD A, '/'
03620 JP SHOW ;GOTO SHOW
03630 SEMIC LD A, ';'
03640 JP SHOW ;GOTO SHOW
03650 UNSHIF LD A, 0 ;0 = LTRS
03660 LD (SHIFT), A ;STASH IT AWAY IN SHIFT

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03670 JP START ;GOTO START
03680 SHOW LD (37E8H), A ;SEND TO LINE PRINTER
03690 CALL 033H ;DISPLAY 'A' ON VIDEO
03700 LD A, (14400) ;CLR/BREAK KEY ROW IN MEM
03710 CP 4 ;BREAK KEY PRESSED ?
03720 JP Z, SPEED ;IF SO, GOTO SPEED CHANGE
03730 JP START ;GOTO START
03740 TIME1 DEFW 1530 ;SAVE 2 BYTES FOR TIME 1
03750 TIME2 DEFW 765 ;SAVE 2 BYTES FOR TIME 2
03760 TIME3 DEFW 865 ;SAVE 2 BYTES FOR TIME 3
03770 SHIFT DEFB 0 ;SAVE A BYTE-SHIFT STATUS
03780 CARRET LD A, 0DH ;0DH = CARRIAGE RETURN
03790 CALL 033H ;DO IT ON VIDEO
03800 RET ;RETURN WHENCE U CAME + 1
03810 CARRTN LD A, 0DH ;CARRIAGE RETURN
03820 LD (37E8H), A ;DO IT ON LINE PRINTER
03830 JP START ;GOTO START
03840 CLS CALL 01C9H ;STANDARD ROM CLS ROUTINE
03850 LD A, 0 ;MODEL 3 COMPATABILITY
03860 OUT (224), A ; " " "
03870 LD A, 48 ; " " "
03880 OUT (236), A ; " " "
03890 RET ;RETURN WHENCE U CAME + 1
03900 END W4UCH ;EL FIN = EL BEGUINE

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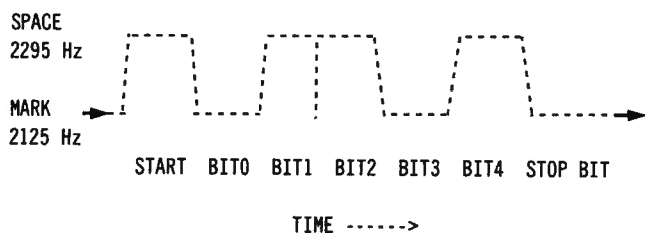
Lines 450-530: The program is initialized with TIME1, TIME2, and TIME3 set at 1530, 765, and 1630 respectively, for 60 words per minute speed. Use the following constants for speeds noted on the Model I. For the Model III you may add 15% due to the faster clock, though the Model I constants will work quite well as the program allows considerable leeway. TIME3 is calculated by the program. TIME2 could ALSO have been calculated, but we like to make Gridley feel "he is contributing" to the program. In the next Chapter, TIMEs 1, 2, & 3 are set when the transmit mode is initialized, though YOU may input them later if you wish for differing transmit and receive speed operation.

	60 SPEED	66 SPEED	75 SPEED	100 SPEED
TIME1	1530	1390	1222	936
TIME2	765	695	611	468

TIME1 = the bit length, TIME2 = 1/2 bit length, and TIME3 = TIME1 + 100, for any given speed.

Lines 450-470 are testing the CLEAR key again, and in the next Chapter will send the program off to the TRANSMIT MODE. Lines 480-500 are waiting for a START bit, and loop to line 450 till one is received. WHEN a START bit is received, the program falls through to line 510 which zeroes out the "D" register and then delays for one-half bit length in lines 520 and 530.

The drawing below illustrates a typical Baudot character. In this case, the letter D = 9 decimal. LSB is sent FIRST.



Bit zero is the least significant bit and Bit 4 the most significant bit. What we are trying to accomplish in lines 520 and 530 via the 1/2 bit length time delay is to CENTER our software UART's timing exactly in the MIDDLE of each bit when we test each bit for a mark or space. After lines 520 and 530 the program should be "dead center" in the middle of the start bit, with respect to time.

Lines 540-880: First delay 1 bit length in lines 540 & 550. This places the program "dead center" in the middle of bit zero. Lines 560 to 580 test bit zero for a mark or space and IF a mark, go off to SET zero and set bit zero of the D register to a one. IF not a mark, bit zero of the D register is left at value zero and lines 590 & 600 do ABSOLUTELY NOTHING except create an equalizing time delay EXACTLY the same as if bit zero had been a mark instead of space. Actually, four NOPs would have been within a microsecond or two of lines 590 & 600, but why not be EXACT instead of sloppy. Lines 610 to 880 repeat the process for the rest of the Baudot word (we really mean character).

Lines 890-920: First delay for one bit length which takes the program into about the first third of the STOP bit, saves the DE register in the stack since D has the Baudot character number in it, and then jumps off to LETTERS in line 1290.

Lines 930-1280: Contain both the SET and speed change instructions.

Lines 1290-1320: First test the MEM location of SHIFT to see whether the previous Baudot character was LETTERS or FIGURES. If letters, it falls through to line 1320 where the stack (previous DE register) is popped into the AF register. If the previous character was FIGURES, then line 1310 sends the program off to FIGS2A in line 1970. The contents of the SHIFT MEM location do much the same thing as the SHIFT key on your typewriter.

Lines 1330-1930: Match up the Baudot decimal value with its appropriate character and send it off to be loaded with its ASCII equivalent. Lines 1850 & 1860 send the program off to set SHIFT in lines 1940-1960 if it was the Baudot FIGURES value.

Lines 1970-2580: Do virtually exactly the same thing for the FIGURES characters as lines 1330-1930 do for the LETTERS characters.

Lines 2590-2620: Do the job of UNSHIFT ON SPACE. Anytime we are receiving Baudot characters in

the FIGURES mode, IF a space occurs these lines force the program back into the LETTERS mode. Depending upon what you are using your radio teletype for (bookkeeping), you may change this feature, though highly unlikely.

Lines 2630-3640: Simply load A register with the ASCII value of the received Baudot character and then jump off to SHOW in line 3680.

Lines 3650-3670: Set the LETTERS/FIGURES MEM location of SHIFT back to LETTERS if the Baudot decimal 31 = LETTERS was received while in the FIGURES mode.

WHAT DID HE SAY ? ? ?

A real mouthful, Gridley. What we meant was that if you are in FIGURES you have GOT TO HAVE SOME WAY TO GET BACK TO LETTERS. This is how it is done.

Line 3680: This line sends "A," the decoded ASCII character to MEM location 37E8H which is both the Model I and Model III memory mapped location for line printer output. IF you have a line printer attached and "TURNED ON" it may print out the character that was received (see the following "LIVE" printout) from ARRL Headquarters via their amateur radio station W1AW that was transmitted as an RTTY bulletin during April 1981. Since we are RECEIVING an RTTY signal of anywhere from 60 to 100 words per minute equivalent speed, it is solely UP TO YOUR PRINTER as to whether or not it can follow the incoming signal's speed. Our Western I/O (IBM) Selectric can printout both 60 and 66 WPM RTTY, but cannot follow the higher speeds. As in MOST good things, you have a choice between quality and speed; i.e., most any dot matrix printer will run up to ten times faster ... but the print quality is not exactly to TEXTBOOK standards. Give a little, take a little.

Lines 3690-3730: Display the received character on the video display and then test MEM for whether the BREAK key is pressed. If so, off to speed change ONLY for the RECEIVE MODE program.

Lines 3740-3830: Reserve MEM locations for TIMES 1, 2, 3, & SHIFT. CARRET and CARRTN provide carriage returns for the video display and line printer, respectively.

Lines 3840-3890: Allow program compatability between the Model I and Model III.

USING THE PROGRAM - ARRL DAILY RADIO TELETYPE BULLETINS

The Flesher TU-170 terminal unit provides 10 volt RMS outputs from both mark and space for an oscilloscope to aid in tuning the RTTY signal. A scope is really unnecessary with the panel tuning meter that is provided. After a few minutes practice, you should have little difficulty tuning in most any RTTY signal that you can hear.

There is one pitfall to avoid. When starting out, do not try tuning in a station transmitting at 66, 75, or 100 words per minute equivalent speed with the receive program set at 60 WPM as it obviously will not work. The American Radio Relay League station, W1AW transmits daily RTTY bulletins at 60 WPM at 0200, 0500, and 2300 UTC daily, plus Monday through Friday at 1600 UTC DURING NON-DAYLIGHT SAVING TIME. During daylight saving time, these RTTY bulletins are transmitted ONE HOUR EARLIER.

Frequencies that would be of interest for these transmissions are: 7.095, 14.095, 21.095, and 28.095 MHz.

The following is a small segment of the W1AW bulletin received at this location on 14.095 MHz on April 9, 1981 USING THIS PROGRAM TO PRINT IT OUT ON OUR WESTERN I/O SELECTRIC PRINTER. The only changes that have been made to it are to change the 72 characters per line to a justified 62 characters per line so it would fit on this page.

QST DE W1AW
HR ARRL BULLETIN NR 40 FROM ARRL HEADQUARTERS
NEWINGTON CT APRIL 9, 1981
TO ALL RADIO AMATEURS BT

THE U.S. COAST GUARD HAS REQUESTED INFORMATION CONCERNING A DISTRESS BEACON THAT WAS TRANSMITTED ON OCTOBER 26, 1980 AT 0400 UTC ON 123.5 AND 243.0 MHZ. THIS TRANSMISSION WOULD HAVE BEEN FOUR TO SIX DASHES OF FOUR SECONDS DURATION EACH. ANY INDIVIDUAL WHO MIGHT HAVE HEARD THIS DISTRESS SIGNAL IS ASKED TO CONTACT THE COAST GUARD OFFICE OF MARINE INVESTIGATION, COMMANDANT G MMI 1, U.S. COAST GUARD HEADQUARTERS, WASHINGTON, D.C. 20593, TELEPHONE 202 426 1455 AR

TELETYPE/ASCII BULLETINS ARE SENT DAILY AT 0200, 0500, AND 2300 UTC AND MONDAY THROUGH FRIDAY AT 1600 UTC. ***

*** NOTE: during non-daylight saving time.

*** NOTE: during non-daylight saving time.

THE BULLETINS WILL NOW BE REPEATED ON 110 BAUD ASCII

The American Radio Relay League's W1AW daily RTTY bulletins are primarily of interest to active ARRL members and cover many ham radio topics. The Friday bulletins are fun to copy and of special interest to that breed of radio amateur interested in working every imaginable RARE COUNTRY, coral reef, atoll, sand-spit, or what-have-you.

CONCLUSION OF CHAPTER 6

We have tried to present as logical and straight forward a Baudot radio teletype receive program as can be written for the TRS-80 Model I and Model III. It is possible to shorten the program somewhat, but NOT without sacrificing the clarity and simplicity that was our primary goal.

For those readers who are not familiar with the functions of many of the CALLS the program uses to Level II ROM, we suggest you read Volumes 1, 2, and 3 of the **Disassembled Handbook for TRS-80**. They are available for \$10, \$15, and \$18 respectively from your local dealer, H & E Computronics, or:

Richcraft Engineering Ltd.
Drawer 1065, Wahmeda Industrial Park
Chatauqua, New York 14722 USA

For those readers who prefer the German language editions, Volumes 1, 2, & 3 (Vol. 4 fall '81) are available from:

Ingenierburo fur Datentechnik
Unter Oelbach 1
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For those readers in the U.K., English language editions of Volumes 1, 2, & 3 (Vol. 4 fall '81) are available from:

General Northern Microcomputers (GNOMIC)
46 Middle Street, Blackhall
Hartlepool, Cleveland
ENGLAND

IN THE NEXT CHAPTER

We will put it all together, Chapters 5 & 6, into a single unified Baudot radio teletype transmit and receive program.

WILL "RECEIVE MODE" TELL ME THE WORDS PER MINUTE SPEED ? ? ?

We give up, Gridley. You win. Yes, the RECEIVE MODE reminder will include the equivalent words per minute speed just in case you have forgotten what it was. The CLEAR KEY will be your transmit/receive switch and if you wish, you may use bit zero or bit one output to PORT ZERO to control your transmitter, receiver, and antenna relay.

continued on page 54

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BEGINNER'S CORNER

Sherry M. Taylor

ELEMENTARY ARRAYS (PART VI)

Here it is Septmeber and our 13th gathering. Beautiful September! I can hardly believe that I made it through the summer. Oh, no, it wasn't the heat that got me down. It was my school-aged son picking fights with his little sister every day for two and a half months. He's back to school now and peace reigns in the castle for 7 hours a day. Hallelujah!!

As you can see by the name above, I am not A. Douglas Werbeck. (No, he did not get a sex change operation! Even if he did, he wouldn't tell you.) Due to a slight conflict of interest, Doug can no longer continue writing the BEGINNER'S CORNER. Not wanting to leave you hanging in mid-air, he has asked me to continue for him, and as he and I agree on most views, I think it should work out well.

I began microcomputing two and a half years ago on a Model I Level II 4 K system. Since then, I have upgraded to a Model III 32K system. However, I am still cassette bound, so I am probably on the same level, equipment-wise, as most beginners. But, my claim to fame is that I have been programming for 2 1/2 years, and I read everthing I can get my hands on that deals with microcomputing, TRS-80 sytle. I am hooked. Also, I am teaching a Beginner's Class to several teachers who are trying to get ready for the new computers just recently bought for their school. So, any questions that are troubling them, I can safely assume are probably troubling you. But, if I don't touch on something that you need help with, please write me. If you would like a personal answer, include a SASE. I'll get back to you as soon as possible.

Okay, on with the show. Let's refresh our memory here so we'll know where we are, and hopefully, know where we are going.

In columns 11 and 12, Doug provided programs that illustrated two of the three possible ways of loading numbers into an array. In column #11, we used the line input by the operator method. In #12, we used the data statement. This time, we are going to have a little fun with our trusty cassette recorder and have the numbers read in from tape.

If you have the last program we used on tape, please load it now. We will have a short musical interlude while you do that.

Okay, I assume you are ready. Our first order of business will be to create a "data tape." A data tape is like a DATA line, except that the numbers are stored on magnetic tape (or disk) rather than within the program.

If you will take a look at the DATA line in the

program, line 100, you will see that there is a line of numbers, each one separated by a comma. Only those numbers will be put on the tape.

To get you prepared for modifying the program, I will have to introduce two new terms: PRINT #-1 and INPUT #-1.

The statement/command PRINT #-1 (pronounced "print number minus one"), turns the recorder motor on, does a CSAVE of the values you listed, and then turns the recorder motor off. The -1 refers to cassette recroder #1. That is because the Model I TRS-80, with the expansion interface, has the ability to use 2 tape recorders. Sorry, Model III folks, only 1 recorder connection for you. (Just as a point of interest: if you had 2 recorders, there is also a PRINT #-2 statement.)

This is the format for PRINT #-1:

```
PRINT #-1, 3, 7, 9, 1, 2, 8
```

It is used normally within a program but can be used as a command outside a program if it is done immediately when you press ENTER.

INPUT #-1 is the opposite of PRINT #-1. This statement turns the recorder motor on, CLOADs the data, then turns the recorder motor off; and, unlike PRINT #-1, INPUT #-1 cannot be used as a command. It must be used inside a program.

Now that we have that background stuff out of the way, let's modify the program that you have already loaded into your electronic marvel.

* Change line 10's REM statement to REM INPUT PROGRAM FOR SEPT. COMPUTRONICS

* Delete lines 30, 80, and 100.

* Replace line 20 with the following line:

```
20 INPUT #-1, P(0,0), P(1,0), P(2,0), P(0,1),  
P(1,1), P(2,1)
```

* Add these lines to the program:

```
11 PRINT "PREPARE THE RECORDER BY INSERTING A BLANK  
TAPE AND SET TO RECORD."
```

```
12 INPUT "PRESS ENTER WHEN READY"; Z$
```

```
13 PRINT #-1, 3, 7, 9, 1, 2, 8
```

```
14 PRINT "THE NUMBERS ARE NOW ON TAPE. REWIND THE  
TAPE AND SET TO PLAY."
```

```
15 INPUT "PRESS ENTER WHEN READY"; Z$
```

Now your program should look like this:

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COMPUTRONICS

```

10 CLS: DIM P(2,1) : REM - INPUT PROGRAM FOR
SEPT. COMPUTRONICS
11 PRINT "PREPARE THE RECORDER BY INSERTING A BLANK
TAPE AND SET TO RECORD."
12 INPUT "PRESS ENTER WHEN READY"; Z$
13 PRINT #1, 3, 7, 9, 1, 2, 8
14 PRINT "THE NUMBERS ARE NOW ON TAPE. REWIND THE
TAPE AND SET TO PLAY."
15 INPUT "PRESS ENTER WHEN READY"; Z$
20 INPUT #1, P(0,0), P(1,0), P(2,0), P(0,1),
P(1,1), P(2,1)
40 PRINT " 0 1 2"
50 PRINT " - - -"
60 PRINT "0 ) ";P(0,0);" "P(1,0);" " ";P(2,0)
70 PRINT "1 ) ";P(0,1);" "P(1,1);" " ";P(2,1) : PRINT
90 PRINT "ALL 6 POSITIONS HAVE BEEN FILLED - END OF PROGRAM"

```

Next, after you are sure everything is right, RUN the program. Obey the prompts, and you should have a nice array printed out on your screen with all positions filled — all by the magic of PRINT #-1 and INPUT #-1. I am sure that you can see the usefulness of this. So you thought that the tape recorder was only for storing programs! Shame on you!

Let's look at an application of this principle: Let's say you are in charge of a hydroelectric plant. It is your job to keep track of how much coal you use during the year so that you can intelligently order coal for the coming months. This would be based on the amount of coal you used for the same months last year. Your foreman measures the coal pile every week. You take his figures and calculate how much coal was used since the last measurement. Each week you enter this figure into the computer to be saved on tape. By the end of the year, you would have 52 totals. Depending on how you add the totals, you could tell how much coal was used in each of the months, how much you used during the quarter, or how much you used all year.

There are a couple of rules you need to be aware of when using the PRINT #-1 and INPUT #-1 statements:

1) Always save the same number of elements as you intend to load back in. If you don't, you will get an OUT OF DATA error.

2) Make sure the variable names match the type of data you are reading (numeric or string). If the computer encounters a number where there should be a STRING, you will get a BAD FILE DATA error.

Since we mentioned the word STRING, let's take a moment to find out what it is. Defined, a STRING is a sequence of alphanumeric characters. "Alphanumeric characters" is computerese for letters and numbers. On the trusty TRS-80, the dollar sign (\$) is used to indicate a STRING variable. (A\$ is pronounced A-string.) For example, A\$="John L. Doe" is a string. So is B\$="123 Sesame Street". In this format, the entire string is enclosed by quotation marks. In DATA

statements and PRINT #-1 and INPUT #-1 statements, they don't have to have the quotes around them unless they contain a comma or other punctuation marks, or include numbers, such as an address.

You may also use DEFSTR to indicate a string variable. DEFSTR Q will cause any variable that begins with Q to be a string. That also means that you cannot use Q (or any other variable defined as a string) as a number. If you do, you will get the old TM ERROR, (type mismatch).

There is a thing called the STRING ARRAY. It is the same thing as a numeric array except that the array positions contain a STRING. For instance, let's say ROOM\$(2)="BRIGHT, SUNNY KITCHEN." As you see, we could have the makings of an adventure. (The green, slimy monster is probably under the sink in the bright, sunny kitchen rather than in the dark, dank, musty dungeon, huh?)

These STRINGS can also be loaded into your array by the same three methods we have covered. For example:

```

100 DATA "DARK, DANK, MUSTY DUNGEON", "BRIGHT, SUNNY
KITCHEN"

```

or

```

100 INPUT #1, "DARK, DANK DUNGEON", ROOM$(2), ROOM$(3)

```

We have now discovered 3 methods of loading values into arrays: 1) line input by the operator, 2) READING the values from a DATA line within the program, and 3) CLOADing the values from a data tape using INPUT #-1.

We have also discovered how to make a data tape to CLOAD from using the PRINT #-1 statement. And, we have seen that working with STRING arrays is no more difficult than working with numeric arrays.

Now a piece of advice. Do you remember I said we were going to have fun with our "trusty" cassette recorders? Well, how do you keep a tape recorder "trusty"? Invest in a tape head demagnetizer and head cleaner. Use it at least every other week, more often if you are a heavy user. I've had many hard-to-load programs load easily after one pass of the head cleaner. If you want to save yourself a lot of frustration, get one.

I guess that about covers it for arrays. The subject for the next gathering of the BEGINNER'S CORNER will be a surprise. I would tell you, but I will need time to evaluate where we are and which direction we *should* go. If you have any ideas on the subject, contact me and let me know what you think. I'm open to suggestions. Send your comments, favorable or unfavorable, to me at the address indicated below.

Until next time, may all your discoveries be good ones!

Sherry M. Taylor
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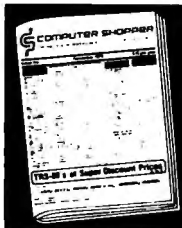
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QUESTIONS AND ANSWERS

Conducted by Hubert S. Howe, Jr.

QUESTION

from Dr. Robert Richardson, Drawer 1065, Chautauqua, NY 14722: I had (wisely or stupidly) the NEW video chip with lower-case descenders (g, j, p, q, y) installed in my ole' trusty Model I when it was out for repair. VERY KINDLY, the repairman did NOT foul-up its use with Electric Pencil, leaving the Pencil switch, et al, alone. The PROBLEM is this: rather than printing "left arrows" after each ENTER, it prints capital Ms. This is really no big problem, but I would like to cure it if you have any suggestions.

ANSWER

There is NO cure; the capital Ms are part of the new video chip that you had installed. It's interesting to note some aspects of this situation that many users aren't aware of.

The video display chip, complete with lower case, is part of every TRS-80 Model I manufactured. Early models used the chip without descenders but with the left arrows, while later models incorporated the descenders with the Ms. "Installing lower case" in a Model I actually involves adding a one-bit RAM chip in the video display section; lower case letters don't display because bit 6 in the video RAM doesn't exist. (The main problem with the Electric Pencil modification was the extra Control key.)

The characters that are printed by the Electric Pencil program to represent carriage returns and line feeds are equivalent to what you get by POKING the ASCII values of these functions (CR=13, LF=10) into the video RAM. If you PRINT these characters, they will produce carriage returns and line feeds rather than Ms or left arrows. On the Model III, which uses an even more sophisticated character generator, certain characters are available ONLY through being POKED into video RAM.

It's difficult to get used to something new, especially when one has been thinking that the left arrows were intended to represent carriage returns when actually it was just a fortuitous happenstance. We sympathize with the problem, but we have gotten used to both systems here at Computronics since we have both types of Model I's.

QUESTION

from R. M. Sanford, 12787 139th Street N., Largo, FL 33540: I purchased a Radio Shack Expansion Interface with zero memory, intending to do my own addition of 16K memory and later 16K more to make 32K total. The first 16K of added memory was ordered from Hobby World Electronics of Northridge, California as their catalog no. 1156B. They advertised no. 1156 for the keyboard, no. 1156A for Expansion Interfaces manufactured before 1979, and no. 1156B for those manufactured since 1979.

The first 16K was installed and has worked perfectly to date. I then ordered a second 16K from the same source, specifying no. 1156B 200 nanosecond type to match the first 16K exactly. Chips received came with an invoice identifying them as no. 1156 for the keyboard unit. A telephone call to Hobby World gave me the information that the chips were all the same and would be ok. A subsequent letter trying to go further into this matter remains unanswered. I have not installed these chips to date.

Hobby World continues to advertise the three separate items no. 1156, 1156A and 1156B. There is no way for me to find out if the chips will work but install them. The second lot of chips are marked 7-684316 8028FJ Japan M5K4116P. Can you tell me their speed rating?

As a second question, memory expansion chips are now advertised from 150 to 300 nanosecond speed. What is best? What is not advisable? A Radio Shack repairman advises me that their chips are 350 nanosecond and that keyboard chips and interface chips are not interchangeable, which is why I have not installed the second group of 16K. I am sure that your readers would appreciate answers to these questions.

ANSWER

The person who told you that "they're all the same" may be closest to the truth. The TRS-80's system clock has a speed of 563 nanoseconds (nS) and therefore should be able to work with chips rated as slow as 500 nS. Since there is a bit of overhead with the processor, memory chips with an access time of 450 nS are usually specified for the TRS-80, to be safe.

When an Expansion Interface is added to the system, there are additional complications due to various design flaws in the interface itself and in the process of sending the signals back and forth across the buffered cable. Memory with an access time of 350 nS is usually specified for the Interface.

All of this changes considerably if you consider adding one of the various speedup modifications to your system. In this case memory chips with access times of at least 300 nS would be specified, and 200 nS would be preferred.

There is no difference in the manufacturing process between 200 and 500 nS memory chips. Each one is tested under stringent conditions and thrown into bins in 50 nS increments from 150 to 500 nS. The fastest ones can cost considerably more than the slower ones, because there are fewer of them. Since the TRS-80 has been introduced, many manufacturers have brought out copies of these RAM chips bearing different numbers and ratings. As a result, they have dropped significantly

in price and are easily available. They are also used in numerous products besides the TRS-80, some with more demanding requirements and others with less, which is why there are so many different ratings.

The only way you can discover whether the chips you purchased will work is to try them out. If you are careful, you will not damage the Expansion Interface if you install them even if they don't work. We have found that you can mix many different kinds of chips in the Interface with no ill effects. Also, and very important, we have noted that many problems that show up as memory errors are not due to bad chips but to corrosion on the Expansion Interface cable or other problems. This can be corrected simply by cleaning the edge connectors with an eraser.

If you would like to understand more about the Model I's problems and possible fixes, there is an excellent article called "When Kicking It Won't Help" by Dennis Bathory Kitzs in issue number 10 of *The Alternate Source* (address: 1806 Ada Street, Lansing, MI 48910).

As we conclude this month's questions, I would like to discuss some limitations that we must place on answering your questions. We are open to any kind of question at all on the TRS-80 computers, and if we can't help you we won't be afraid to say so. If you have a question about a program published in *Computronics*, unless it relates to a typographical error in the published copy, we will usually just forward it to the author of the program. Since we almost always publish the names and addresses of the authors in the magazine, you may prefer to write them yourself. They are not under any obligation to reply, but most of them are interested in your questions and want to know how others are making use of their programs. If you think there is an error in the published copy, check the next couple of issues for corrections, for we usually catch simple errors and inform our readers quickly.

If you have a question about a piece of software that you have purchased either from *Computronics* or from another vendor, we probably cannot answer it unless we have had extensive experience with the program. We have had experience with many programs, and we try out everything that we sell before we accept it, but you will probably get better results by writing directly to the authors of the program.

Finally, don't send us a listing of a program and say, "You find the error!" If you do want to send us a copy of a program, send it on media rather than on paper. Be sure to describe the nature of your problems in detail, and tell us the computer and configuration you are using, including peripherals.

Got a question about the TRS-80? Send it to **Questions, H & E Computronics, 50 North Pascack Road, Spring Valley, NY 10977**. If you wish a personal reply, please enclose a self-addressed, stamped envelope. ■

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CHAPTER 6 ADDENDUM

CASSETTE TEST TAPE 60-66-75-100 WPM BAUDOT & 110 BAUD ASCII:

Richcraft is NOT in the teletype cassette tape business, but does offer a standard cassette tape that may be played through the TRS-80's cassette player/recorder to test the Baudot and ASCII receive programs in Chapters 6 and 9.

The audio frequency shift keying accuracy is better than plus or minus 1/2 Hertz for both the 2125 cycle Mark tone and 2295 cycle Space tone at 60, 66, 75, and 100 words per minute equivalent speed in Baudot and also at 110 Baud ASCII, if your cassette is operating properly.

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1. A number of users do not have a calibrated lab standard source for testing TRS-80 based TTY receiving systems.

2. It is difficult to find 66, 75, and 100 speed Baudot RTTY stations on the ham bands when one needs them. And, when one finds them their absolute and frequency shift accuracy is often somewhat less than lab standard.

3. Our Editor believes it would be useful to the readers.

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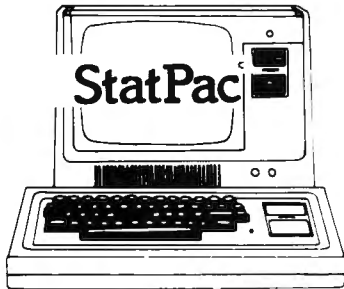
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THE GUARDED BOMB

Chris Jaggi

This program is designed for a 16K Level II TRS-80. In this game of skill and strategy, you must try to get the bomb and take it out of the room before being captured by the guard, who is determined to let the bomb go off. The location of the door you must escape through is shown at the start of the game. I assure you that there is a way to win the game in 31 time units. You are given 200 time units, so you should have plenty of time.

The DATA statements at the beginning of the program are locations on the screen where the guard reaches an intersection. If this happens, then the program will jump to a specified subroutine from lines 405 to 407. This will enable the guard to make the best move possible. If you stay far enough away from the guard, then he might not bother you unless you get too close to the bomb.

Lines 3000 to 3030 set up what the dungeon will look like. An X\$ stands for four graphics blocks, while Y\$ stands for four spaces. If you have a keypad, then your controls are "8" up, "4" left, "6" right, and "2" down. Use "5" to stop or to run into a wall (ouch!).

If you don't have a keypad, then make the following changes in lines 410, 440, 470, 500, and 401:

- Change the "4" in line 410 to a "J".
- Change the "8" in line 440 to an "I".
- Change the "6" in line 470 to an "L".
- Change the "2" in line 500 to a "N".
- Change the "5" in line 401 to a "K".

With these changes, your controls would be "I" up, "J" left, "L" right, "N" down, and "K" to stop.

If, heaven forbid, you should ever get bored with the game, try playing against a rougher time limit by changing the value of TI in line 310. Lots of luck, and happy deactivating!

```
Ø DATA 68,76,84,1Ø4,12Ø,132,248,264,268,276,292,296,3Ø4,376
1Ø DATA 416,42Ø,492,496;5Ø4,516,52Ø,532,544,556
2Ø REM C O M P U T R O N I C S C O N T E S T
3Ø REMA T H E G U A R D E D B O M B
4Ø REMAR B Y : CHRIS JAGGI
5Ø REMARK V E R S I O N 2 . Ø
1ØØ CLS : GOTO 1ØØØØ
2ØØ CLS : FOR X=1 TO 4 : PRINT A$(X); : NEXT
21Ø .A=7Ø8 : B=536
22Ø C$=CHR$(136)+CHR$(171)+CHR$(151)+CHR$(132) : D$=" "
23Ø C$(1)=C$
3ØØ PRINT @A,C$; : PRINT @B,C$;
31Ø AA=Ø : Z=732 : BB=3 : TI=2ØØ : G=Ø : R=Ø
32Ø PRINT @668,"TIME ";
33Ø PRINT @248,"(:)";
34Ø PRINT @1Ø8,"DOOR";CHR$(94);" :"; :PRINT @A-64,"YOU";
35Ø PRINT @B-7,"GUARD";: FOR X=1 TO 1ØØØ : NEXT
```

```
36Ø PRINT @1Ø8,STRING$(8,32);
37Ø PRINT @A-64," ";: PRINT @B-7," ";
4ØØ Q$= INKEY$ : PRINT @Z,TI;D$; : TI=TI-1 : IF TI=-1 THEN 252Ø
4Ø1 IF R<Ø1 AND A=248 THEN GOSUB 8ØØØ ELSE IF Q$="5" THEN AA=Ø:
Q$="" ELSE IF Q$<" " THEN GOSUB 6ØØ
4Ø2 IF R=1 THEN GOSUB 9ØØØ ELSE IF AA=Ø THEN 4Ø5
4Ø3 ON AA GOSUB 41Ø,44Ø,47Ø,5ØØ
4Ø5 IF B<269 THEN FOR X=1TO9: IF B<>B(X) THEN NEXT : GOTO 4Ø9:
ELSE ON X GOSUB 4ØØØ,4ØØ5,4ØØ5,4Ø1Ø,4Ø15,4Ø15,4ØØØ,4Ø2Ø
4Ø6 IF B<493 AND B>268 THEN FOR X=1 TO 8 : IF B<>B(X+9)
THEN NEXT:
GOTO 4Ø9: ELSE ON X GOSUB 5ØØØ,5ØØ5,5Ø1Ø,4Ø2Ø,5Ø15,4ØØØ,5Ø2Ø,5Ø25
4Ø7 IF B<493 THEN FOR X=1TO7: IF B<>B(X+9+8) THEN NEXT :
GOTO 4Ø9:
ELSE ON X GOSUB 6ØØØ,5Ø2Ø,6Ø1Ø,6Ø15,6Ø2Ø,6Ø2Ø,5Ø2Ø
4Ø9 GOTO 7ØØØ
41Ø IF Q$="4" OR AA=1 THEN C=PEEK(1536Ø+A-4) :
IF C>128 AND C<192 THEN AA=Ø ELSE 43Ø
42Ø RETURN
43Ø AA=1: PRINT @A,D$;:A=A-4: PRINT @A,C$(1);
44Ø IF Q$="8" OR AA=2 THEN C=PEEK(1536Ø+A-63):
IF C>128 AND C<192 THEN AA=Ø ELSE 46Ø
45Ø RETURN
46Ø AA=2: PRINT @A,D$;:A=A-64: PRINT @A,C$(1);
47Ø IF Q$="6" OR AA=3 THEN C=PEEK(1536Ø+A+5):
IF C>128 AND C<192 THEN AA=Ø ELSE 49Ø
48Ø RETURN
49Ø AA=3: PRINT @A,D$;:A=A+4: PRINT @A,C$(1);
5ØØ IF Q$="2" OR AA=4 THEN C=PEEK(1536Ø+A+65):
IF C>128 AND C<192 THEN AA=Ø ELSE 52Ø
51Ø RETURN
52Ø AA=4: PRINT @A,D$;:A=A+64: PRINT @A,C$(1);
54Ø RETURN
6ØØ IF Q$="4" THEN AA=1 ELSE IF Q$="8" THEN AA=2
ELSE IF Q$="6" THEN AA=3 ELSE IF Q$="2" THEN AA=4
61Ø RETURN
251Ø IF G<Ø1 THEN GOSUB 9ØØØ ELSE IF R=1 AND G<Ø1
THEN PRINT @896,"TOO LATE";STRING$(29,32);
ELSE PRINT @896,STRING$(37,128);: GOSUB 1ØØØØ: GOTO 2ØØ
2511 G=1:R=Ø: GOTO 251Ø
252Ø PRINT @Z,"OUT ";: GOTO 251Ø
29ØØ CLEAR 2ØØØ: DEFINT A-Z: DIM B(24)
291Ø FOR X=1TO24: READ T:B(X)=T: NEXTX
3ØØØ X$=STRING$(4,191):Y$=" ":
A$(1)=STRING$(68,1Ø1)+STRING$(56,128)+
X$+X$+Y$+X$+Y$+X$+Y$+X$+X$+X$+X$+Y$+X$+X$+X$+Y$+X$+
X$+X$+X$+Y$+X$+Y$+X$+X$+X$+X$+Y$+X$+X$+X$+Y$
3Ø1Ø A$(2)=X$+X$+X$+Y$+Y$+X$+Y$+Y$+Y$+Y$+Y$+Y$+Y$+Y$+
X$+X$+X$+X$+Y$+X$+X$+Y$+X$+X$+X$+X$+Y$+X$+X$+
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X$+Y$+X$+Y$+X$+X$+X$+Y$+X$+X$+Y$+X$+X$+Y$+
3Ø2Ø A$(3)=Y$+X$+X$+STRING$(44,128)+
STRING$(2Ø,191)+ STRING$(16,128)+ STRING$(24,191)+
STRING$(16,32)+X$+X$+ STRING$(16,32)+X$+ STRING$(16,32)+X$+
STRING$(8,32)
```

continued on page 58

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 MEMORY LOSS?
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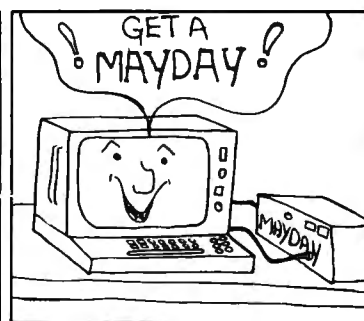
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Processes

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- ★ Add, change or delete records within the Chart of Accounts (Master) File.
- ★ List the Chart of Accounts File.
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- ★ List the Transactions File.
- ★ If other Peachtree Software packages are present, pass summary transactions from these packages to the General Ledger at the end of the accounting period.
- ★ At the end of an accounting period, print out the major reports:
 - (1) Trial Balance (Detail Report)
 - (2) Transaction Registers
 - (3) Balance Sheet
 - (4) Prior Year Comparative Balance Sheet
 - (5) Income Statement
 - (6) Prior Year Comparative Income Statement
 - (7) Department Income Statements

File Information

There are two main computer files maintained within the General Ledger System.

- (1) The of Accounts File
 - Account Number
 - Description
 - Account Type
 - Balance Sheet Column Code
 - Current Amount
 - Year-To-Date Amount
 - Budget Amount
 - Prior Year Monthly Amounts
- (2) The Transactions File
 - Account Number
 - Description
 - Source Code
 - Reference
 - Date
 - Amount

ACCOUNTS RECEIVABLE

Processes

- ★ Add, change or delete records within the Customer File.
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- ★ Prepare invoices and statements.
- ★ Produce the following reports:
 - (1) Aged Accounts Receivable
 - (2) Invoice Register
 - (3) Payment, Credit and Adjustment Register
 - (4) Customer Account Status Report
- ★ At the end of a month, post the following items to the General Ledger:
 - (1) Invoiced Sales
 - (2) Freight Charges
 - (3) Sales Tax
 - (4) Service Charge Income
 - (5) Cash Payments
 - (6) Discounts Allowed
 - (7) Returns/Credits
 - (8) Income Adjustments
 - (9) Accounts Receivable

File Information

There are three main computer files maintained within the Accounts Receivable System, the Customer File, the Invoice File, and the Transaction File.

CUSTOMER FILE

Customer Account Number
Customer Name
Address
Phone
Type of Account
Credit Terms
Credit Limit
Tax Rate
Discount Rate
Date of Last Credit
Date of Last Debit
Amount of Last Credit
Amount of Last Debit
Current Balance
High Balance
Year-To-Date Sales
Year-To-Date Payments
Automatic Billing Amount

INVOICE FILE

Invoice Number
Invoice Date
Invoice Amount
Credit Terms

TRANSACTION FILE

Transaction Type
Transaction Date
Transaction Amount

ACCOUNTS PAYABLE

Processes

- ★ Add, change or delete records within the Vendor File.
- ★ List the Vendor File.
- ★ Enter vouchers.
- ★ Automatically determine which vouchers to pay.
- ★ Print checks and a Check Register.
- ★ Produce the following reports:
 - (1) Open Voucher Report.
 - (2) Accounts Payable Aging Report.
 - (3) Cash Requirements.
- ★ At the end of a month, prepare the General Ledger Transfer File, passing the following information for each debit or credit transaction:
 - (1) Account Number
 - (2) Description
 - (3) Source Code
 - (4) Date
 - (5) Amount

File Information

There are two main computer files maintained within the Accounts Payable System, the Vendor File and the Voucher File.

VENDOR FILE

Vendor Code
Vendor Name
Address
Phone
Year-To-Date Purchases
Year-To-Date Payments
Current Balance
Last Payment
Date of Last Payment
Monthly Entry Flag
Due Date of Month
Debit Account Number
Amount (Debit)
Month Last Paid

This file may also contain information to enable generation of automatic vouchers for those items such as rent or bank payments that are paid every month.

VOUCHER FILE

Voucher Code
Voucher Date
Amount Due
Date Due
Discount Percent
Discount Amount
Discount Date
Invoice Number
Invoice Date
Status

Plus up to six account number-amount fields for General Ledger account numbers to which the amount due is to be distributed.

PAYROLL

Processes

- ★ Add, change or delete records within the Employee File.
 - ★ List the Employee File.
 - ★ Modify the Tax Information Files.
 - ★ At the end of a pay period -
 - (1) Calculate Pay
 - (2) Print Checks
 - (3) Print Payroll Register
 - ★ At the end of a month -
 - (1) Print the monthly summary
 - (2) Print the Unemployment Tax Report
 - (3) Prepare the General Ledger Transfer File, passing the following information:
 - Net Pay (Cash)
 - Employee FICA Withheld
 - Federal Tax Withheld
 - Insurance Deductions
 - Miscellaneous Deductions
 - State Tax Withheld
 - Local Tax Withheld
- The gross pay for up to twenty payroll departments may also be passed to the General Ledger.
- ★ At the end of a quarter, print the 941A report information.
 - ★ At the end of a year, print the W-2 forms.

File Information

There are two main computer files maintained within the Payroll System, the Employee Master File and the Tax File.

EMPLOYEE MASTER FILE

Name
Address
Local Code
State Code
Marital Status
Exemptions, Federal
Exemptions, State
Social Security Number
Pay Period
Pay Type
Pay Rate
Insurance Deduction
Miscellaneous Deduction
Date Employed
Date Terminated
Last Check Information

Payroll (con't)

And current, month-to-date, quarter-to-date and year-to-date totals for:

Regular Earnings
Overtime Hours/Earnings
Other Hours Rate/Earnings
Commission Earnings
Miscellaneous Income
FICA Deductions
Federal Deductions
State Deductions
Local Deductions
Insurance Deductions
Miscellaneous Deductions

TAX FILE

(for single and married persons)
Federal Tax Information Tables
State Tax Information Tables
Local Withholding Tax Information Tables

An Overview of the Inventory System

Inventory is probably the most speculative of all of a company's assets. A true measure of the effectiveness of management is the ability with which it supervises the inventory control function.

The Peachtree Software™ Inventory Management System is designed to (1) give you better merchandise control, (2) allow you to lower your dollar investment in inventory, and (3) improve customer service and response.

The System maintains detailed information on each inventory item including the part number, description, unit of measure, vendor and reorder data, item activity, and complete information on current item costs, pricing, and sales. Transactions effecting inventory (sales, receipts, adjustments) may be applied at any time to insure the inventory data is always up to date and accurate.

As with all Peachtree products, the system is interactive, simple to operate, and provides reports that are up to date and comprehensive.

Particular features of the Peachtree Software™ Inventory Management System include:

- Interactive, menu-driven programs
- Self-instructing user documentation
- Long item number - up to 15 characters
- Departmentalizing of items
- Multiple pricing levels
- Processes items on reserve (committed but still in stock)
- Online item query at any time
- Comprehensive management reporting
- Automatic month end file backup
- Recovery routines for hardware failures
- Sample data for demonstration and training

How the System is Designed

The Inventory Management System operates with an **Inventory Master File** which allows for the creation of each inventory item and for the recording of transactions (sales, receipts, returns, reserves, and adjustments) to each inventory item.

The **Inventory Master File** contains the item number, description and various other data on item costs, prices, reorder levels, vendor reference, and activity. The items within the **Master File** are entered, changed, deleted, and queried through the **Inventory Master File Maintenance** program. All data on all items may be listed by using the **Detail Inventory Report** program.

Transactions may be applied at any time to the **Master File** through the **Enter Inventory Transactions** program. An **Update Report** automatically prints during this entry process to provide an audit trail of all inventory activity.

Several reports are available for the maintaining of stock, analysis, and forecasting. These reports include the **Physical Inventory Worksheet**, **Inventory Price List**, **Departmental Summary Report**, **Inventory Status Report**, the **Reorder Report** and the **Period-to-Date** and **Year-to-Date** reports.

At the end of an accounting period (usually a month), and then again at the end of a year, the **End of Period Processing** program is run to update current balances and clear previous balances.

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- 6) Execute only protection feature for BASIC programs
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- 8) Device I/O handling with FORCE command
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- 11) Allows disable-enable to break key
- 12) Allows user to define step rate per drive and re-configure system disk
- 13) Allows for efficient use of double-headed drives
- 14) Built in screen printer (shift [CLEAR] with [BREAK] key abort)
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- 17) New printer driver which allows complete forms control and paging
- 18) Automatic serial printer driver with optional auto linefeed
- 19) Execute any DOS command from BASIC and return to BASIC
- 20) Free space map of diskette with optional output to printer
- 21) Copy with variable length files
- 22) Complete RS232 control from keyboard with status check
- 23) Create and pre-allocate files from DOS
- 24) Display current date and time from DOS
- 25) More information from Directory with optional printer output
- 26) Enter DEBUG with shift [BREAK] to allow use of [BREAK] from BASIC
- 27) New DISKDUMP/CMD sector display/modify program (works with filespecs)
- 28) New DISKZAP/CMD single/double density disk editor
- 29) New BACKUP (more reliable, no more pack ID check)
- 30) New FORMAT (more reliable, no need to bulk erase disk first)
- 31) New MAP utility (maps out disk, showing where files are located)

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- 1) Single drive copy
- 2) Restore (dead files)
- 3) Purge (unwanted files)
- 4) Clearfile (destroys data by writing zeros to file)
- 5) Transfer (moves all user files from one disk to another)
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- 7) Crunch (Basic program compressor)

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- 5) Shorthand features for editing (listing and editing with single key)
- 6) CMD"M" instantly displays currently set variables
- 7) Global search and replace in BASIC text
- 8) Line printer TAB to 255
- 9) OPEN"E" to end of sequential file (for output)
- 10) DI (delete and insert text line)
- 11) DU (duplicate text line)
- 12) "R" & "V" options after LOAD and RUN (files open & save variable)
- 13) OPEN"D" allowed (Model II compatible) equal to OPEN"R"
- 14) DOS commands from BASIC
- 15) Automatic, error-free variable length records
- 16) Single step execution with TRON (fabulous for debugging)
- 17) CRUNCH (BASIC program compressor)
- 18) New TBASIC (tiny BASIC) offers full BASIC commands
- 19) TBASIC and DOSPLUS together only use BK of RAM (40K left in 48K TRS-80)

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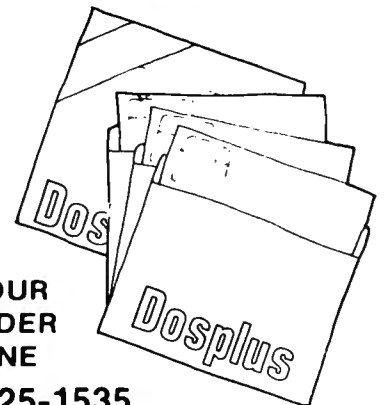
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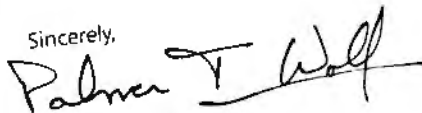
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